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AIRTRENDS

Washington, D. C., Jan. 17, 1955

ONLY THING CERTAIN ABOUT CAB VACANCY and chairmanship at presstime is that it is still up in the air. Last minute upset of a White House staff decision Jan. 5 to appoint Harold A. Jones to fill the chairmanship and to appoint former chairman Oswald Ryan to ICAO, throws whole outcome into question.

Jones, a former member of the board now serving with ICAO, met stiffest opposition from local service carriers because of his previous record on their problems. President Eisenhower killed the White House staff recommendations on Jan. 7 after details of the "final" decision had leaked out.

Present CAB situation: Chan Gurney is acting chairman—Ryan's term as chairman expired at year's end. Thus, CAB has only four members pending a new appointment. Term of new appointee will run until Dec. 31, 1960. Next two terms to expire, both held by Democrats, are Josh Lee's on Dec. 31 of this year and Joseph P. Adams' on Dec. 31, 1956.

ALSO UNDECIDED IS A SUCCESSOR TO ROBERT B. MURRAY, JR., as Under Secretary of Commerce for Transportation. Jones figured prominently in earlier speculation about a replacement for Murray, whose resignation becomes effective later this month, but Eisenhower action on his CAB candidacy leaves his current status clouded.

Other candidates: Earl B. Smith, director of transportation and communications for the Defense Department; Francis V. DuPont, public roads commissioner; Louis Rothchild, maritime administrator for Missouri; and Fred Glass, director of aviation for the Port of New York Authority.

LABOR OUTLOOK FOR 1955: No strikes in the aircraft manufacturing industry. Year just ended was first since Korea with no major walkout in a major airframe, engine, or propeller plant. Recently signed contracts between CIO-Autoworkers and AFL-Machinists and major aircraft facilities carry into spring of 1956.

Airline labor picture is not so bright. Machinists are still threatening to strike Eastern, TWA, United, National, Capital, and Northwest simultaneously. Dispute is currently in hands of a three-man Presidential fact-finding board. Moreover, there has still been no settlement between the AFL-Air Line Pilots Association and the airlines on the eight-hour flight issue, which resulted in a 25-day walkout last August at American Airlines. United and TWA are also involved in the eight-hour dispute.

MILITARY BUDGET OUTLOOK: U. S. Air Force to get half of total.

Informed sources place USAF share of new money at $14.5 billion, the Army's at $7.3 billion, the Navy's at $8.9 billion, and the Secretary of Defense's office at $600 million. Total new money is thus pegged at about $31.4 billion.

President Eisenhower is reported ready to ask for $3 billion more to cover a pay raise, the new reserve program, and military construction. Half of this sum is expected to come out of money appropriated for other purposes in the past, bringing the total to be sought for the military services to about $32.9 billion.

AIRTRENDS *(Continued)*

TITANIUM OUTLOOK IS MUCH BRIGHTER. Past 90 days has seen a major shift in titanium quality control, making it possible to produce alloys that can be worked consistently with uniform results. Broad scale applications of titanium are likely during the coming year.

AIRBORNE RADAR FOR AIRLINE FLEETS will undergo thorough development test programs during the next 12 months with major fleet installations following in 1956. New factor in timing of fleet installations may be the Air Line Pilots Association's reported "new look" at its past demands for full take-off temperature and humidity accountability. Pilots are taking a close look at relative gains in safety to be obtained by airborne radar vs. accountability for the same economic penalty.

Competing for the multi-million dollar market will be three producers: Bendix Radio, Radio Corporation of America, and Collins Radio Co. Bendix and RCA are now in production and will supply most of the evaluation equipment. Collins' prototype C-band unit will be flying in a matter of months.

VISCOUNT PRODUCTION IS BEING STEPPED UP to meet Vickers-Armstrongs' current promise of 24-month delivery on new orders. Company is confident it can meet, if not exceed, its target of 55 aircraft in 1955. Vickers' Hurn plant is being enlarged and production at Weybridge boosted to two per month.

NO NEW LEGISLATION directed at the aviation industry was introduced in the opening days of the 84th Congress. All 10 civil aviation bills introduced on opening day were repeats from the 83rd Congress, five of these being introduced by Rep. Carl Hinshaw (R-Calif.). Among these bills, the ones proposing permanent certification of existing local service air carriers (H. R. 526) and giving CAB rate-making authority covering "off-set" of individual domestic airline earnings in establishing their international mail pay (H. R. 439) are most significant.

Proposals to reorganize CAA and CAB, contained in a bill introduced by the late Senator Pat McCarran (D-Nev.) will apparently be scrapped by the new Congress, but a new bill calling for 20-odd amendments to the present Civil Aeronautics Act will highlight the findings of the extensive hearings staged by McCarran last year. The new proposal, to be introduced by Sen. John Bricker (R-O.), would amend rather than replace the existing act.

SIGNS OF THE TIMES: BOAC has applied to the British government for permission to buy 19 Douglas DC-7C transports. This action undoubtably stems from uncertainty over the future of the Comet and the delays in the Britannia program (AMERICAN AVIATION, Jan. 3).

ALL-OUT EFFORT BY THE STATE DEPARTMENT to prevent TWA and PAA from losing their traffic rights in India after Jan. 14 was underway at presstime. U. S.-Indian bilateral air transport agreement, which had been denounced by India a year ago, expired on that date. India wants to incorporate provisions enabling it to regulate capacity and frequency of U. S. flag services to and through India. A temporary agreement covering operations at reduced frequency may be used to permit continuity of operations pending a final agreement.

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Official Airline Guide: Monthly publication of airline schedules and fares. $13.50 per year in USA; $14.00 in Canada; $15.00 elsewhere. Published from 139 N. Clark St., Chicago 2, Ill. Phone: Central 6-5804. Managing Editor—Robert Parrish.

Air Traffic News (Incorporating Air Traffic Digest): Daily rates and tariff news. $175 per year. Managing Editor—Wallace I. Longstreth.

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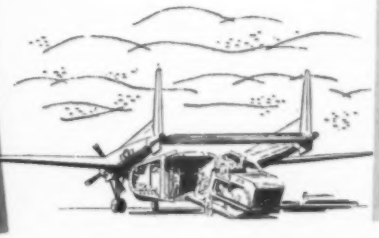

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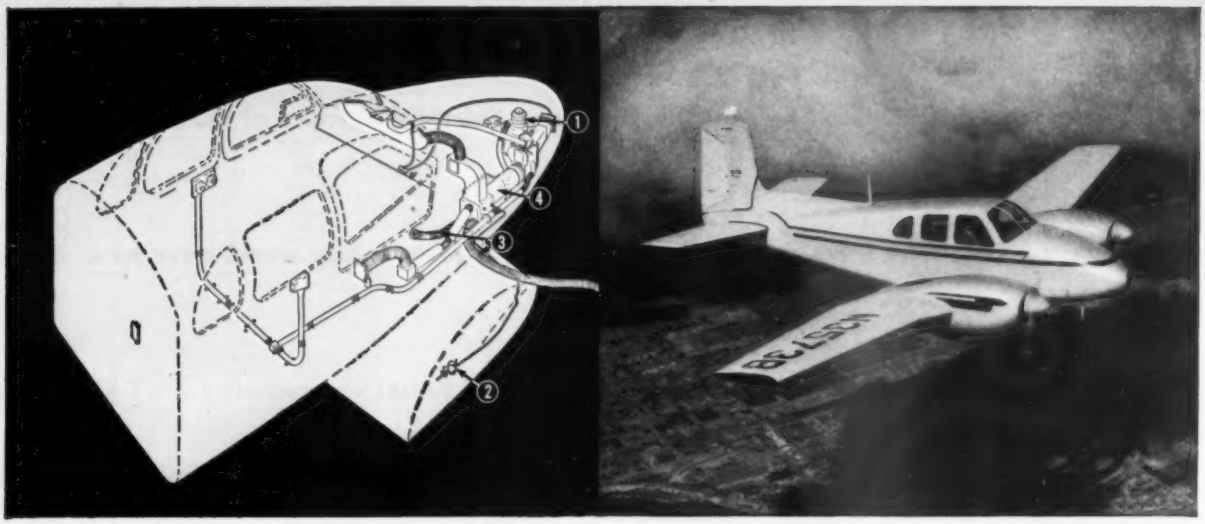

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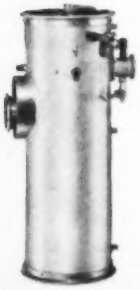

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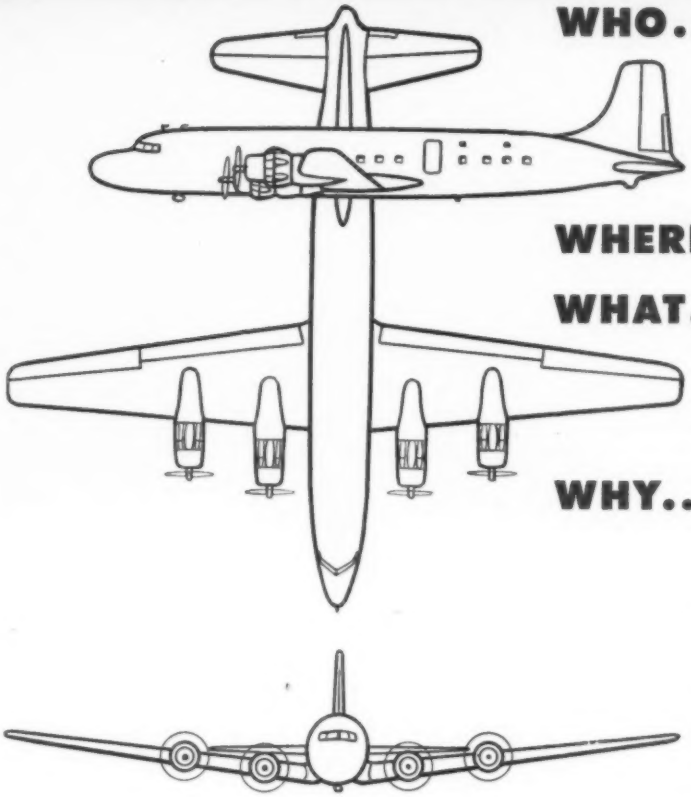

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Letters

Representation by BRC

To the Editor:

As a PAA employee, I was much interested in your editorial entitled "Which Side" under Personal View in the Dec. 20 issue.

The majority of covered employees at Pan American are opposed to their representation by the BRC, but under terms of the union shop agreement between PAA and the union negotiated in May 1952 are compelled to pay dues or face dismissal.

A decision of the National Labor Relations Board has established the right of employees under the National Labor Relations Act to challenge a union shop agreement entered into against the wishes of the employees concerned, and to force revocation of the agreement by a majority vote.

The Railway Labor Act, however, allows no such privilege to employees in the transportation industry. The right to question the BRC-PAA agreement was explicitly denied in a letter to me by the National Mediation Board dated Jan. 5, 1953.

It is clear that transportation employees suffer under a severe disability as compared with other industrial workers. The remedy would appear to lie in an amendment of the Railway Labor Act to bring it into line with the more liberal provisions of the National Labor Relations Act. Alternatively, the inequity as it concerns airline employees might be eliminated by removing them from the jurisdiction of the National Mediation Board and placing the regulation of their industrial relations under the scope of the National Labor Relations Act.

Since this would deprive the BRC of a rich source of revenue, one may feel confident that that union's powerful Washington lobby would offer quite effective opposition to such a move.

H. A. ELKIN

Which Side Indeed

To the Editor:

Your editorial, "Which Side?" in the December 20 issue brings to mind 1951 when the passenger service employees of our company voted their choice of three bargaining representatives. Among these was the Brotherhood of Railway & Steamship Clerks.

As you know, local service airline employees in their daily work are aware of the diversified activities of airline operation. Failing to see what we had in common with the rail or steamship lines we chose a bargaining agent who was 100% airline in interest, the Airline Agents Association Int'l, an affiliate of the Airline Pilots Association Int'l.

G. B. PATRICK
North Central Airlines, Inc.
Iron Mountain, Michigan

Cost of Weight Saving

To the Editor:

I was very distressed on reading in your November 8th issue of AMERICAN AVIATION in the Industry Spotlight column a statement from Douglas' Dr. Leo Schapiro concerning the cost of weight saved for titanium at the figure of $400.00 per pound.

This figure undoubtedly came from the National Titanium Symposium Meeting, and at the time it was pointed out that this figure was in error and inconsistent with various bills of material that have been computed.

We have a very deep interest in the entire titanium fastening program and such publicity as this is most definitely detrimental to the work we have been attempting to do.

The error in computing this figure of $400.00 per pound arises from the fact that Dr. Schapiro's figures were based upon building one airplane from titanium which you know is actually not a practical way to account for it.

On a production basis, such as we are furnishing titanium fastenings at the present time, the actual figure per pound of weight saved amounts to about $100.00 to $125.00 a pound. This figure is not arrived at by taking any one particular bolt and computing a cost or a price, but rather by taking a bill of material from various airframe manufacturers and computing the actual cost of titanium fastenings and the weight thereof and what it has cost to save a pound of weight.

THOMAS F. SPOEHR
The H. M. Harper Company
Morton Grove, Illinois

Agreement With Editorial

To the Editor:

We the employees of Pacific Northern Airlines are in full agreement with your recent editorial in AMERICAN AVIATION, "Deterioration" of the CAB. We also believe your magazine and your articles can do much to bring the antics of the Civil Aeronautics Board out into the open where it can be observed by the critical and the impartial public eye.

The recent rumor, that the certificate of Pacific Northern Airlines and the States-Alaska route shall not be renewed, has met with a great deal of public protest in the Pacific Northwest and particularly in the Territory of Alaska. If it were not for the remarkable record of service and economy by Pacific Northern there would certainly be no public interest in this airline. We are sure you followed the States-Alaska case closely so we will not review the record of service and economy by Pacific Northern Airlines in this letter.

It appears to us a shameful waste of time and money to review testimony on a recertification and then in disregard of the testimony award the certificate or certificates to those who cannot best serve the public, to those who will cost the government more in subsidies and the public in taxes. It appears then that our government, which is trying to cut down expenditures, is not trying to cut expenditures in this case.

Furthermore, it appears to us that our government which supposedly opposes monopolies is handing out monopolies in the form of air carrier certificates.

This rumored decision by the CAB is a disservice to the people of the United States, the people of Alaska, and the loyal, diligent employees who have helped build PNA into a truly fine airline.

Our hats off to you for your editorial.

PATRICK J. FISHER
Pacific Northern Airlines
Employees Club

Airline Commentary

To the Editor:

I think your page "Airline Commentary". . . is excellent. Four ideas which I plagiarized from your column have proved to be very resultful.

JACK I. RICH
Hawaiian Airlines
Wailuku, Maui

To the Editor:

I would like to add my personal congratulations to you for your very interesting, constructive and professionally handled "Airline Commentary" department. I am one of your faithful readers and always find your column helpful and enjoyable.

BERT D. LYNN
Western Air Lines, Inc.
Los Angeles, Calif.

Jan. 17, 1955 - Vol. 18, No. 17

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Capital Airlines VISCOUNT

POWERED BY ROLLS-ROYCE

A New Concep In Comfort

The Capital Viscount* is indeed a new concept in passenger comfort. Never before have you experienced flight so swift, yet so pleasantly free from disturbing noise and vibration.

Inside the Viscount, you'll enjoy the panoramic view from large picture windows, the perfect pressurization and air-conditioning, and the unique fold-away table at each deep-cushioned seat. The quiet elegance of the Viscount is a luxury *once known — never forgotten.*

*Pronounced Vi-Count

The Viscount — powered by four Rolls-Royce propeller-turbine (turbo-prop) engines and proved by more than 100 million safe passenger hours — will be serving Capital cities soon. Watch for the announcement.

SWIFT, SMOOTH, SILENT, SURE...

Capital AIRLINES

Are you one of a select group of aerodynamicists sincerely interested in boundary layer control projects? The Aircraft Division of Fairchild offers a genuine creative opportunity to such men.

Fairchild has been intensively engaged in boundary layer control studies since 1951. In addition to building up its own staff of engineers specializing in boundary layer control, the company has contracts in effect with Mississippi State University and leading authorities in boundary layer control at Princeton and the University of Wichita. Recently, Fairchild appropriated more than a million dollars of company funds for an accelerated program of boundary layer control.

Gracious country living only minutes away from urban Baltimore or Washington . . . paid pension plan . . . an excellent salary with paid vacations . . . an ideal working environment . . . generous health, hospitalization and life insurance . . . and the many other benefits of a progressive company add to the pleasure of working with Fairchild.

You'll be investing wisely in a secure future if you take time today to write to Walter Tydon, Chief Engineer, outlining your qualifications. Your correspondence will be kept in complete confidence, of course.

☆ BOUNDARY LAYER CONTROL

ENGINE AND AIRPLANE CORPORATION

FAIRCHILD

Aircraft Division

HAGERSTOWN, MARYLAND

Circle No. 4 on Reader Service Card.

When & Where

Jan. 19-23—Miami International Aerorama, Miami International Airport, Miami, Fla.

Jan. 24—Honors Night Dinner, Institute of the Aeronautical Sciences, Hotel Sheraton-Astor, New York City.

Jan. 24-28—Twenty-third annual mtg., Institute of the Aeronautical Sciences, Hotel Sheraton-Astor, New York City.

Jan. 27-28—Air Transport Association rotocraft committee mtg., New York City.

Feb. 8-10—National Association of State Aviation Officials winter board mtg., Lafayette Hotel, Washington, D. C.

Feb. 20-22—Fourth annual Texas Agricultural Aviation Conference, A&M College of Texas, College Station, Tex.

Mar. 11—Institute of the Aeronautical Sciences national flight propulsion mtg., (restricted), Hotel Carter, Cleveland.

Mar. 20-23—Aero Medical Assn. 26th annual mtg., Hotel Statler, Wash., D. C.

Mar. 28-Apr. 1—Ninth Western Metal Exposition, Pan-Pacific Auditorium, Los Angeles.

Mar. 28-Apr. 1—American Society for Metals exposition and congress (including all-day session on aircraft and rocketry sponsored by the American Welding Society), Pan Pacific Auditorium and Ambassador Hotel, Los Angeles.

April 5-7—Radio Technical Commission for Aeronautics Spring Assembly Meeting, Los Angeles.

Apr. 18-21—Society of Automotive Engineers production forum and aeronautic mtg., Hotel Statler and McAlpin Hotel, New York City.

Apr. 18-21—Society of Automotive Engineers, Golden Anniversary aeronautic mtg., aeronautic product forum and aircraft engineering display, Hotel Statler and McAlpin Hotel, New York City.

Apr. 18-22—American Society of Mechanical Engineers, 75th anniversary mtg., Baltimore.

Apr. 20-22—American Rocket Society spring mtg., Baltimore.

Apr. 29—Institute of Navigation's eastern regional mtg., Friendship International Airport, Baltimore.

May 2-5—Society of Aeronautical Weight Engineers annual national conference, Hilton Hotel, Fort Worth.

May 4-6—Fourth International Aviation Trade Show, 69th Regiment Armory, New York City.

May 30-June 5—Aviation Writers Association annual convention, Montreal & Toronto.

June 21-24—Joint mtg. of the Institute of The Aeronautical Sciences and the Royal Aeronautical Society of Great Britain, IAS Building, Los Angeles.

June 23-25—Institute of Navigation annual mtg., Air University, Maxwell AFB, Ala.

Oct. 11-15—Society of Automotive Engineers aeronautic mtg., aircraft production forum, and aircraft engineering forum, Hotel Statler, Los Angeles.

Oct. 11-15—National Association of State Aviation Officials annual mtg., Baker Hotel, Dallas, Tex.

Oct. 31-Nov. 2—Society of Automotive Engineers transportation mtg., The Chase, St. Louis.

INTERNATIONAL

Jan. 25—International Civil Aviation Organization Council, 24th session, Montreal.

Jan. 25—ICAO Air Navigation Commission, 18h session, Montreal.

Jan. 26—ICAO Air Transport Committee, 24th session, Montreal.

Mar. 31-Apr. 1—Symposium on Boundary Layer Effects in Aerodynamics, National Physical Laboratory, Teddington, England.

Apr. 5—International Air Transport Association technical conference, San Juan, P. R.

NEW FJ-4 FURY FEATURES "pump that couldn't be built"

Intended for combat at near sonic speeds, North American Aviation's FJ-4 Fury jet fighter is characterized by thin wings. The carrier-based craft, first flown on October 28, 1954, relies on a new-type Pesco fuel transfer pump and three Pesco submerged fuel pumps.

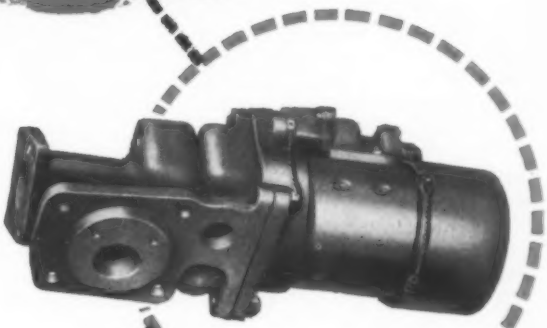
The U.S. Navy's newest jet fighter, the North American Aviation FJ-4 Fury, uses a revolutionary new Pesco pump in a line-mounted fuel transfer application. This—the pump that couldn't be built—is the first centrifugal impeller type pump ever perfected for such use.

The extremely thin wings of the FJ-4 prevented use of submerged fuel pumps in the wing tanks, so Pesco engineered the so-called "impossible" pump. A radically new Pesco-designed impeller permits the pump to overcome long inlet line losses and deliver a full flow of JP-4 fuel up to 45,000 feet altitude. The pump is instantly self-repriming should it become unprimed during manuevers.

Designed for a 1200 hour overhaul cycle, this motor-driven pump is powered by a Pesco-built DC Electric Motor. Precise and powerful, it weighs only 7.4 pounds and its 11″ x 5″ x 5″ envelope fits into a close-tolerance fuselage location.

Three submerged fuel pumps in the fuselage tank are other Pesco components of the fuel system which supplies the Wright J-65-W4 power plant.

The "pump that couldn't be built" typifies Pesco's continued success in solving difficult aircraft pumping problems. If you have such a problem, take advantage of the development facilities, engineering experience and greatly increased manufacturing capacity of Pesco. Call or write: PESCO, 24700 North Miles Road, Bedford, Ohio.



Model 122913-010 Fuel Transfer Pump was specially developed by Pesco for FJ-4. Able to pump boiling fuel, run "dry" for 15 hours and reprime itself, this pump performs a function previously considered impossible for a line-mounted aircraft fuel pump.

engineering Pesco production

PRODUCTS DIVISION

BORG-WARNER CORPORATION

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Circle No. 5 on Reader Service Card.

Personal View

By WAYNE W. PARRISH

Easy Road to Success

FOUR SMART OPERATORS by the names of Stanley Weiss, James Fischgrund, Jack B. Lewin, and Roscoe Hart, have demonstrated how to make a big success in the airline business without all the red tape involved in obtaining a certificate of public convenience and necessity from the Civil Aeronautics Board.

They started out shortly after the war with some C-46's and then graduated to DC-4's and now they have one DC-6B flying a transcontinental daily aircoach service and a second DC-6B will be in operation shortly. They operate under the name of North American Airlines, they have ticket offices, they advertise quite freely, and they've made a lot of dough. They're in the big league now along with the Rickenbackers, the C. R. Smiths, the Pattersons, and the Damons, but they've done it the fast and easy way.

Crashing into the airline business is much easier than starting radio stations or other public utilities. If anyone started a radio station without a license from the Federal Communications Commission the station would be clamped shut within a matter of hours. But the quintet of members on the Civil Aeronautics Board are quite jovial fellows afraid to offend anyone's feelings and Messrs. Weiss, Fischgrund, Lewin, and Hart have been able to spiral a surplus C-46 operation into quite a neat little business.

It turned out to be quite simple. Most important was the hiring of a smart lawyer, and what better than to take an alert chap by the name of Hardy Maclay right out from the CAB staff itself. Mr. Maclay is a very adroit lawyer and has tied the CAB up in knots by one maneuver after another. Another important key to the road to success was the ability to buy, borrow, transfer, and otherwise shift around a group of irregular carrier franchises so that now you see one and now you don't.

In the earlier days, following World War II, irregular operators were allowed in the air transport field on grounds that they were small business, deserving of opportunity and government support. Well, a DC-6B operation may or may not be classed as small business depending on what you compare it with. Next to U. S. Steel, two DC-6B's are small business, but next to a local service airline that has fought, sweated, and cussed out a certificate of public convenience and necessity through CAB's bureaucratic mazes, two DC-6B's with their enormous earning capacity on cream-skimming routes, loom pretty large.

Every so often the CAB goes on a crying jag saying that it doesn't have enough power to enforce the letter and the intent and the spirit of the Civil Aeronautics Act, but crying jags are usually the expressions of weaknesses and lack of guts. The only real alibi that can be offered in CAB is by the understaffed Office of Compliance, which has done pretty well under the circumstances, but the real source of the trouble is the quintet of five members who look pretty silly as public servants when a smart quartet by the names of Weiss, Fischgrund, Lewin, and Hart can operate a daily transcontinental DC-6B service (nonstop eastbound, no less!) without benefit of a certificate of public convenience and necessity.

The certificated airlines could pick up a few good tips from the North American "combine." As an example of how CAB carries out its public duties, it's been a long time now since Air France began operating a nonstop service between New York and Mexico City, which was quite in order according to all of the international agreements entered into by the U. S. But incredible as it seems, there isn't yet a single U. S. carrier operating the same nonstop service, a situation not to be duplicated in any other part of the world where citizens have just pride in their own services and country.

Another example of staunch CAB leadership could be found just recently where the CAB staff and the CAB itself had all agreed that a trunk carrier be permitted to withdraw from a small and unprofitable town in favor of a local carrier. It was all set, until a delegation of citizens from this small town called on the CAB chairman who promptly wilted and ordered the initial decision withdrawn without even consulting with his colleagues.

So it all proves that short cuts pay off if you're dealing with the CAB. Hire a good lawyer, don't bother to read the Civil Aeronautics Act, take on an ex-Senator as propaganda expert, and go ahead into business. You won't be bothered much by the CAB, that is unless and until you go through the motions of obtaining a certificate of public convenience and necessity. And oh brother, that's the day when your troubles really begin.

NASAO Takes Sides

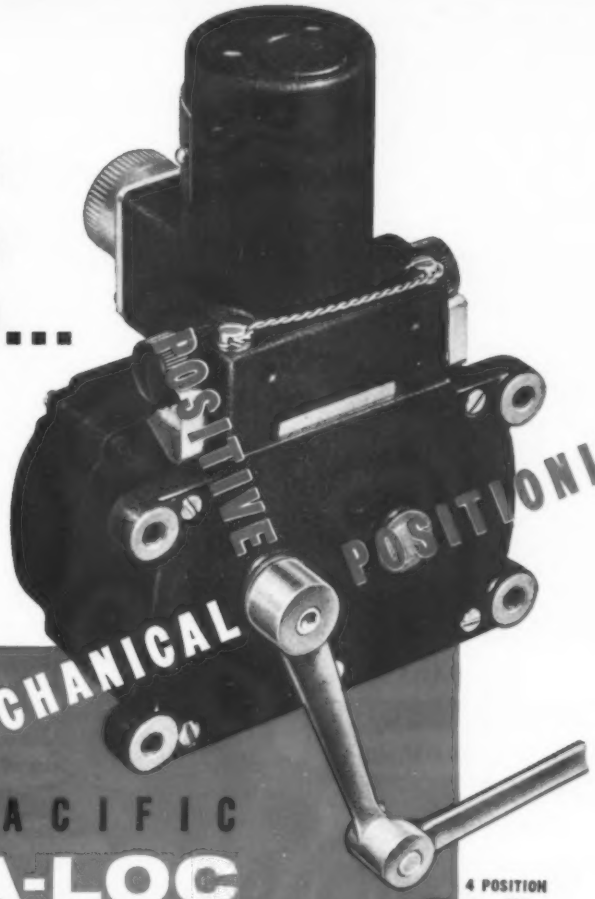
A curious and quite unexpected new twist has been added to the now famous but still unconcluded Cedarhurst case involving airspace rights adjacent to New York's International Airport at Idlewild.

The National Association of State Aviation Officials, which traditionally might be expected to align itself with other aviation interests, has entered the case on the side of the Village of Cedarhurst.

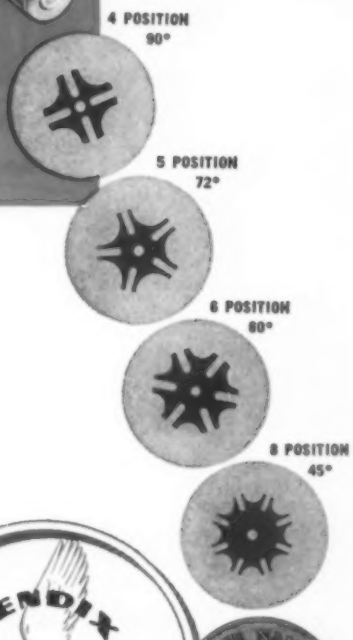
A somewhat amorphous group from its beginning, NASAO seems to think the federal government is preempting too much authority in the field of aviation and is doing so through the guise of safety regulations. What interests us especially is NASAO's position that property rights of one class of persons are being harmed "in favor of another class of persons, such as the airlines or airport management."

This is an all-too-narrow view, in our opinion. In the final analysis it is not a selfish class of people, such as airlines and airport managements, who are involved in these airport disputes, but the general public itself. It is the public as users of airports and air transportation services which is directly concerned, not only from the standpoint of safety but from the standpoint of convenience as well. We are quite surprised, and not favorably, at NASAO entering such an injunction suit on the opposite side of aviation interests.

THE ACTUATOR WITH...



BENDIX-PACIFIC GENEVA-LOC ELECTRIC ACTUATORS



The exclusive Geneva cam action in these famous Bendix-Pacific Electric Actuators rotates the shaft to the exact position, then locks it against movement. This mechanically controlled positioning is completely independent of motor overtravel and all limit switches, brakes, clutches, etc., are eliminated. Geneva-Loc Actuators require no attention.

The high speed motor starts and stops at no load and the gear ratio is constantly variable, starting and ending at infinity, resulting in smooth starts, and stops and extended motor, gear and switch life. Geneva-Loc Actuators can be used to advantage on any installation where the positions are predetermined and if more than two, equally spaced. Ideal for valves and other controls. Standard units have travel increments of 45°, 60°, 72°, or 90°. Pacific Division Engineers are available to assist you.

Write for Bulletin 114

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Canadian Distributors: Aviation Electric, Ltd., Montreal 9

Export Division: Bendix International 205 E. 42nd St., N. Y. 17

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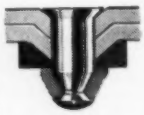
Uneven driving forces during rivet installation can crack skin panels. Rework is costly.

Using regular HI-SHEAR pins and collars, a countersunk strip can be added to seat the collar. This adds another part and weight.



your double dimple solution

Now, your structure design can be more effective by using the new HI-SHEAR collar–countersunk and flanged–to match the sub-dimple and obtain HI-SHEAR advantages of reduced weight, space and time.

The HS53 24ST collar is used with alloy steel HI-SHEAR pins, i.e. HS51P; the HS54 A17ST collar accommodates the HS25 75ST pin.

Standard HI-SHEAR Sets form the collar to the pin with less force than required to upset DD icebox rivets – thus avoiding skin cracks.

write

for specification data on the HS53 and HS54 collars.

U.S. and Foreign Patents – Trademark Registered

THE *hi-shear* RIVET TOOL CO.
8924 BELLANCA AVENUE
LOS ANGELES, CALIF.

Circle No. 7 on Reader Service Card.

Industry Spotlight

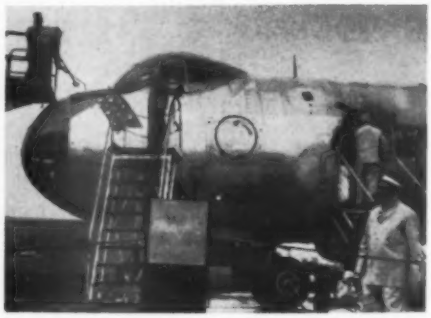
• New variation in the reverse thrust field is revealed with General Electric's disclosure that it has developed a thrust-spoiler for the J47 engine to be used to slow down the Boeing B-47 in flight, apparently for tactical purposes. System uses a tailpipe-mounted spoiler to deflect engine thrust before the gases leave the exhaust nozzle. GE has also developed a lightweight thrust reverser which in actual installations has given 35% of the engine's dry rating in reverse thrust.

• USAF has grounded Republic F-84F's powered by Buick-built Curtiss-Wright J65-B-3 and J65-W-3 engines with 25 hours or less time as of Jan. 1. Air Materiel Command ordered the grounding pending corrective action on engine; compressor troubles. Only a small number of F-84F's are affected.

• Lear, Inc.'s Aircraft Engineering Div. is offering its Learstar high-performance landing gear wheel and brake system to Lockheed Lodestar operators in kit form for $3,000. It includes new wheels, brakes, special parts, hardware, and drawings for the conversion. Goodyear's single-disc, three-spot brakes, used for the modification, have more than double the capacity of existing installations.

• Despite a requirement for the elimination of elevator and aileron seals on its Vickers Viscounts, Trans-Canada Air Lines' first aircraft (and probably several subsequent ones) has the seals as a result of Air Registration Board's refusal to certificate the model without them. Removal of the seals reportedly affected handling qualities of the aircraft.

• Convair's contract with the USAF to decontaminate a B-36 bomber used in atomic bombing introduces a new factor in aircraft maintenance consideration: radiation. Crews working on the project at Convair's Ft. Worth plant were provided with special radiation suits and related equipment.



Radiation suits for ground crew

• Accelerated state of developments in Lockheed's L-1449A program, the program to get an advanced turboprop-powered Connie flying as soon as possible, is highlighted by visit of a contingent of CAA engineering division personnel to Lockheed for certification talks. Group was headed by W. H. Weeks, chief of the engineering division and included Ray Malloy of Flight Test, A. A. Vollmecke of Structures, and Steve Raleigh of Powerplants.

• Rolls-Royce is going to run a Dart turboprop engine to destruction in order to gain experience on ultimate component lives. The engine will be given regular overhaul checks as if it were in normal airline use. No British single engine has gone through more than about four overhauls and thus component life is largely unknown.

• A lightweight radar for use as a helicopter navigation aid has been designed by Bendix-Pacific and will soon be introduced to the industry. Unit is said to have a range up to 20 miles and will be in the 60-pound class. New radar will be complementary to the company's Decca system (see page 40) for helicopter navigation.

• Airlift priority, now getting considerable attention because of the stepped-up tempo of air logistics planning, would go to the two percent of the 725,000 items of USAF inventory which makes up some 40% of the total inventory dollar value.

SKYDROL sweeps the fleets!

New Airline Users Prove World-wide Demand for Skydrol Safety

It's more than a trend! Today, U.S. and foreign airlines are switching to Skydrol in a wholesale, industry-wide move. Here's why:

- Skydrol is the only fire-resistant hydraulic fluid for hydraulic systems and cabin supercharger transmissions approved by the C.A.A.
- Skydrol has *never* been implicated in a fire . . . in over 3 million flying hours.
- Skydrol lengthens the life of pumps up to 34%, lowers overhaul cost on components as much as 20%.
- In supercharger service, Skydrol outlasts mineral oil 16 to 1.
- Skydrol won't corrode metals or alloys, is stable at operating temperatures, pressures.

SKYDROL: Reg. U.S. Pat. Off.

It costs less than you think—less than a single brake fire—to convert your planes to Skydrol. For information phone, write or wire Organic Chemicals Division, MONSANTO CHEMICAL COMPANY, Box 478-P, St. Louis 1, Mo.

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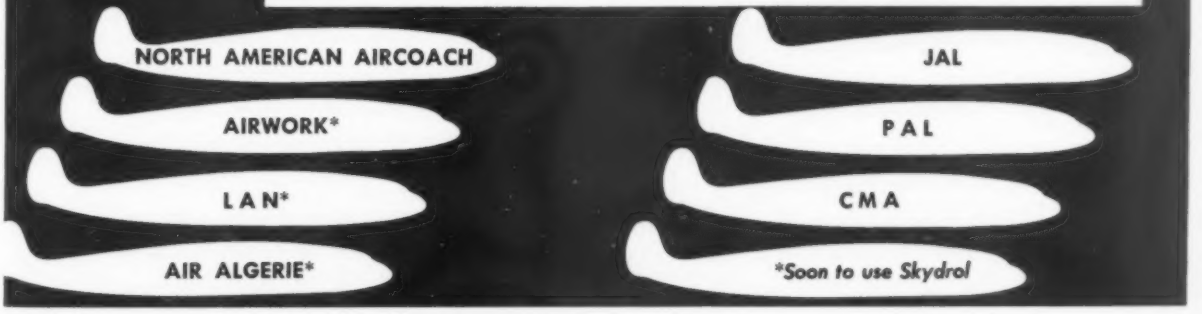
Serving Industry . . . Which Serves Mankind



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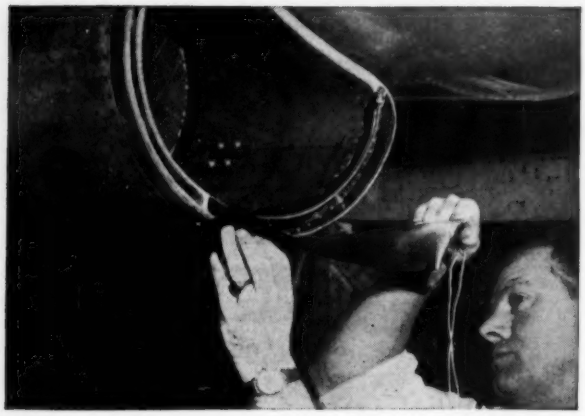
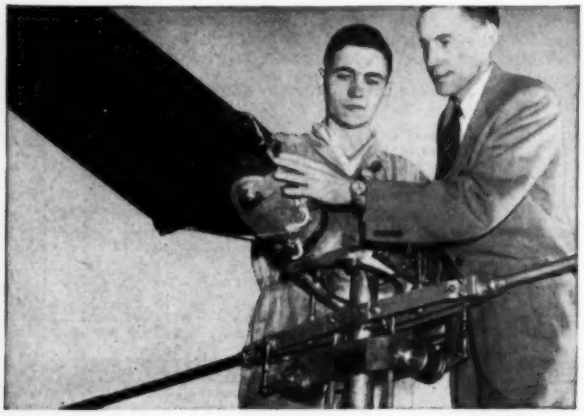
RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER

How to keep planes from coming down with the cold



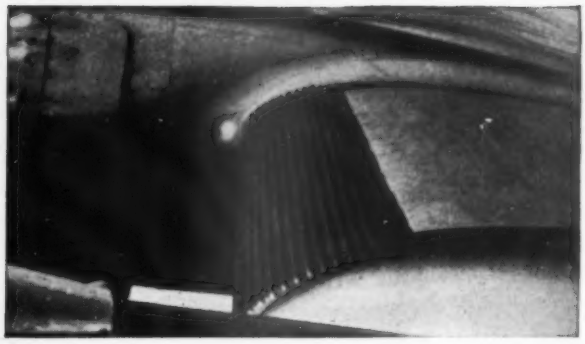
KEEPS ICE FROM CHOKING A PLANE'S THROAT

Ice forming in the narrow "throat" of an engine intake could soon choke off vital air supply. B. F. Goodrich electrically heated rubber—rubber with resistance wires in it like a heating pad—prevents ice from forming. Its flexibility lets it fit skin-tight around the intake's bulges, curves and corners. BFG heated rubber also gives cold weather protection on propeller blades, spinner domes, hydraulic lines, many other parts.



EGG BEATER WHIPS ICE

The weight of ice forming on rotor blades used to ground helicopters in cold weather. The problem was to design an anti-icing system that wouldn't add as much weight as the ice. B. F. Goodrich engineers developed a set of specially shaped heated rubber boots that minimized weight and bulk. 30-day tests in freezing rain and snow, down to −14°F, proved their worth. The biggest single obstacle to all-weather helicopter operation was removed.



MAKES ICE REMOVING A SNAP

This B. F. Goodrich De-Icer has rubber tubes that inflate to crack ice off wing leading edges. B. F. Goodrich De-Icers have been giving planes ice protection since 1930. Latest type De-Icers snap off ice faster by inflating quicker with almost three times the pressure of earlier models. They last longer, too, because they're simply cemented to the wing without stretching or fixed tension.

RUBBER BOOTS HELP BUSINESSMEN HURRY

"We can count on B. F. Goodrich De-Icers to keep wings of our plane ice-free," say flight personnel of the Hoover Company. "They enable us to make trips we otherwise couldn't make." Practically every executive plane of twin-engine size or larger has De-Icer plumbing already built-in, making the cost of De-Icer installation low-cost insurance.

For 25 years, B. F. Goodrich engineers have been solving aircraft icing problems of all kinds. Why not let them put this background of experience to work for you? Write *The B. F. Goodrich Company, Aeronautical Sales, Akron, Ohio.*

B.F.Goodrich
FIRST IN RUBBER

Circle No. 9 on Reader Service Card.

ESTABLISHED JUNE 1, 1937
VOL. 18, NO. 17

World's Largest Aviation Publishers
American Aviation

MARTIN'S XP6M-1, THE SEAMASTER

NAVY'S AIR ARM TAKES THE LEAD

with jet seaplane, super carriers, and atom-power plans

By ROBERT M. LOEBELSON

NAVAL AVIATION entered a new era last week with the public unveiling of the first large turbojet-powered seaplane in history, The Glenn L. Martin Co.'s XP6M-1 Seamaster.

This event, plus the recent christening of the first of the USN's super aircraft carriers, USS Forrestal, at Norfolk, Va., plus plans to request funds for a third Forrestal-class carrier in the Jan. 17 budget message, plus revelation of several other new plane types during 1954, meant that the Navy Bureau of Aeronautics, like the USAF, was going all-out to be ready for any possible war with Russia.

Naval officials are enthusiastic about the newest carriers, which were designed specifically for the supersonic Navy jet fighters and bombers. But they foresee an equally promising future for the attack seaplane, exemplified by the XP6M-1.

Said James H. Smith, Jr., Assistant Navy Secretary for Air: "There will be other mobile deterrent forces to strengthen U. S. strategy in the age of missiles. Very long-range missiles launched from submarines and surface ships constitute one fruitful line of advance. Also promising, I think, is the long-range attack seaplane. This has been an additional advantage which the carrier force lacks—they can be widely dispersed in many small, relatively inexpensive units, in areas where maintenance of other forces would be too costly. Two or three seaplane squadrons in an area thousands of miles from American soil could maintain a threat to an entire flank and require a diversion of enemy bases from other fronts, without exposing vulnerable fixed bases to an enemy's counterattack. Failure to exploit this advantage would leave an enemy able to concentrate his forces in areas closest to the targets he seeks in the U. S. . . ."

Martin's XP6M, which has an announced speed of more than 600 mph, a normal cruise altitude of 40,000 feet, and a range "sufficient to accomplish its mission," seems to be the seaplane Smith had in mind. Although Martin has a contract for only the two prototypes, it would appear that the Navy is definitely planning to order the water-based plane into production.

Primary missions of the Seamaster are minelaying and photo-reconnaissance, but Martin has proposed and Navy is considering other versions, including bomber, cargo/transport, and jet tanker.

But the XP6M is just one of a covey of new Navy fighting planes which have just gone into production or seem destined for it in present configuration or with slight changes. Among them:

- **Chance Vought's F7U3 Cutlass** *(2 Westinghouse J46 engines, 700 mph plus).*
- **CVA's forthcoming F8U day fighter** *(1 Pratt & Whitney J57, supersonic).*
- **Convair's XFY-1** vertical take-off fighter *(1 Allison T40 turboprop, 500 mph plus).*
- **Convair's F2Y-1,** better known as the **Sea Dart** *(2 Westinghouse J46's, 500 mph plus).* Production on this craft will probably be limited.
- **Douglas' A3D** or **Skywarrior** *(2, P&W J57's, 600-700 mph).*
- **Douglas' A4D lightweight Skyhawk** *(1 Wright J65, transonic).*
- **Douglas F4D Skyray** *(1 P&W J57, supersonic).*
- **Grumman F9F-8,** better known as the **Cougar** *(1 P&W J48, 650 mph plus).*
- **Grumman F9F-9** or **Tiger** *(1 Wright J65, supersonic).*
- **Lockheed XFV-1** *(1 Allison T40, 500 mph plus).*
- **McDonnell F3H-2 Demon** *(1 Allison J71, 650-750 mph).*

• **McDonnell's** as yet undesignated all-weather attack fighter *(probably two jet engines, supersonic).*

• **North American Aviation's FJ-3 and FJ-4 Fury** *(1 Wright J65, 650 mph plus).*

• **Possibly a folding wing** carrier-version of NAA's supersonic F-100 for the USAF *(1 P&W J57).*

LOCKHEED'S XFV-1

McDONNELL'S DEMON

• **In addition,** the Navy has ordered a limited number of turboprop-powered cargo water-based transports from Convair, the R3Y Tradewind *(4 Allison T40's, 380 mph plus).*

Thus BuAer, which historically has been getting about one-third as much money as the USAF to buy new aircraft *(the ratio in recent years has been about 3:1 including orders for MDAP nations),* is now figuring on getting almost as many types which are supersonic in level flight as the Air Force. The Navy, of course, will get fewer numerically than the USAF.

(Supersonic planes in production for the AF include the NAA F-100, McDonnell F-101, Convair F-102, Lockheed F-104, and the Convair B-58. Republic's F-105, slated for production after the F-84F, is also in the supersonic category).

While not capable of Mach 1 speeds or better, the Martin XP6M is definitely the forerunner of a supersonic seaplane, probably one powered by atomic engines. This fact was brought out by Secretary Smith when he reported: "With perhaps half a dozen seaplanes, a single tender, and a pair of tanker submarines, we could provide an integrated force that an enemy could not ignore. Once nuclear propulsion can be fitted to the seaplanes—and for this they appear ideally adapted—the submarines could be dispensed with and the tender base moved still farther back out of attack range." To this statement, George S. Trimble, Martin's vice president for advanced designed, has added: "Figuratively speaking, I would also say that the marriage of nuclear power and the military seaplane is definitely under way."

(Martin has never officially stated that it is working on a water-based craft using atomic engines. But it has announced receipt of contracts to do atomic research. An atomic seaplane would shield crew members from radiation by lowering contaminated wastes into the water on landing).

Thus, as 1955 begins, the air arm has become the dominant force in the Navy. The battleship concept is dead. The aircraft carrier and the planes it launches have come to the fore. And looking beyond the carrier, the Navy is betting on the water-based bomber to maintain it as one of the principal military services—perhaps even more dominant than the USAF is now because AF planes are tied to land bases, whereas water-based Seamaster-type aircraft could operate from five-sixths of the earth's surface. • • •

CONVAIR'S XFY-1

Seamaster . . .

forerunner of commercial jet transport?

Does The Glenn L. Martin Co. consider the XP6M-1 the prototype of a commercial jet transport capable of competing with the Boeing 707, Lockheed L-193, and Douglas DC-8? Jess Sweetser, Martin's v.p. for commercial sales, says yes and no.

There is no doubt that Martin, which lost millions on its last three commercial ventures (the Clipper flying boats before the war and the 2-0-2 and 4-0-4 twin-engine transports in the postwar period) is extremely reluctant to get back into commercial production.

But it is equally true that many Martin officials are still sold on flying boats as commercial planes and would not be averse to trying to sell a later development of the XP6M to long-haul airlines if development costs were paid for by either the airlines involved or one of the military services.

Among the advantages of a commercial flying boat: Operable almost anywhere because no special runways are required; no stacking problem in bad weather.

Present version of the Seamaster for the Navy was built as a mine-laying and reconnaissance vehicle and is therefore not readily adaptable to a cargo or passenger transport.

Moreover, even if much of the military equipment in the XP6M were deleted, it is doubtful if the present plane would be able to carry as many as 100 passengers across the Atlantic, for example.

But the Navy is now studying Martin's proposal for a passenger/cargo version of the XP6M. If BuAer officials order this version, Martin may decide to go ahead with a commercial sales drive. As Sweetser says, "It's up to the Navy."

Specifications . . .

Powerplants: Four Allison J71's (about 10,000 pounds thrust each) with afterburners mounted in two sets of nacelles atop the main wing on either side of the fuselage to prevent spray damage.

Speed: 600 miles per hour plus.

Normal cruise altitude: 40,000 feet.

Payload: 30,000 pounds (obviously enough for one or more atomic or hydrogen bombs).

Crew: Five men, including pilot, co-pilot, navigator-minelayer, radio operator, and armament defense operator.

Pressurization: In flight, the cabin can be maintained at 21,000 feet against a true 50,000-foot altitude.

General configuration: Long slender hull with a "T" tail standing 35 feet high.

Operating capabilities: Designed for Sea State 3, i.e., under conditions where waves average six feet.

Fuel storage: Tanks are located within the wings.

Special features: Water-tight rotary bomb/mine door. Loadable while plane is afloat or beached. Fixed plastic floats at wing tips to supply buoyancy while the plane is at rest in the water. Hydroflaps on both sides of the hull afterbody act as brakes when opened together, as a rudder to permit short turns when opened separately. Engine nacelles contain hinged panels permitting engine changes while the plane is afloat.

Unusual advantages: Refuelable at sea from seagoing tankers or from submarines.

First flight: Early spring, 1955.

U. S. Closing Gap in Jet Engines

• British scientist compares aircraft developments in America and Great Britain

STEWART SCOTT HALL

THE U. S. has not surpassed Britain in jet engine development but "there are signs that the gap is closing," Stewart Scott Hall, Britain's top defense scientist in the U. S., told AMERICAN AVIATION in an exclusive interview. He warned that "unless Britain can rapidly parallel American resources in experimental equipment and test facilities she may lose the lead she has held since the day in 1941 when Whittle first ran the W2B centrifugal jet."

Scott Hall's views on aviation are based not only on an intimate knowledge of the British scene but also on a close acquaintanceship with developments in the U. S. In his present position in Washington he heads up an organization the function of which is to facilitate the exchange of defense research and development information between Britain and the U. S.

Discussing American and British gas turbines, Scott Hall points out that general comparisons are difficult due to differing operational and design requirements on either side of the Atlantic which confuse the issue, as do different requirements for ancillaries associated with the engine. "Thus, whereas in the U. S. the afterburner appears to be regarded as an integral part of almost every jet engine, in Britain this feature is looked upon far more as an ancillary," he observes.

Scott Hall believes that Britain has more successful jet engines to its credit than the U. S. "It is significant," he declares "that we have taken out no licenses to build American jet engines in Britain, whereas a number of British engine designs have been licensed for construction in the U. S.," instancing the Rolls-Royce Tay (P&W J48), Armstrong-Siddeley Sapphire (Wright J65), and Bristol Olympus (Wright J67) as examples.

Scott Hall says that, compared with American engines, for thrust delivered British units are usually lighter and British specific consumptions are generally lower. Moreover, the development time scale is shorter in Britain and prototype engines are more usually delivered around the time specified than in the U. S., according to the British official. He believes that British engine constructors still lead the way in new ideas, giving as examples the Rolls-Royce Conway embodying the by-pass principle and the development of ultra lightweight engines.

Scott Hall endorses the view that British progress in the engine field is due to three things:

• **British contractual methods** for engine research in the past have been more encouraging to rapid advance than those adopted in the U. S.

• **British manufacturers** have had more freedom to change their designs during the course of development, when this appeared desirable, without protracted argument with the customer.

• **British specifications** are more flexible.

Nevertheless, Scott Hall warns that "as jet engines get bigger and more complex and are required to operate under conditions of higher and higher speed and greater and greater altitudes, the provision of very large and costly experimental equipment such as wind tunnels and high-altitude test plants becomes essential." He notes that in the provision of such equipment "the U. S. leads the world . . . " He says that "these advantages cannot fail to pay off and the existence of such an engine as the P&W J57 proves that they are doing so."

Scott Hall credits U. S. research facilities for the fact that the U. S. is ahead of Britain in the aircraft field as far as speed is concerned. He notes that a "large number of transonic and supersonic wind tunnels have been available for some time" and that data has been accumulated fast. "Even more important," he considers, "has been the supersonic flight experience obtained by NACA." He notes that "no other country in the free world has a facility to compare with Edwards AFB, an ideal terrain for high-speed flight development."

Nevertheless, Scott Hall points out that modern fighters cannot be judged solely by speed. He considers that other characteristics of equal importance are rate of climb, operational altitude, maneuverability, and weight of armament. "I believe in these aspects British fighters can bear comparison with any," Scott Hall declares, adding: "Nevertheless, Britain is fully alive to the speed attainments of American aircraft and if we think that these can be obtained without undue sacrifice of fighting qualities which we believe to be essential, we shall do our utmost to equal them."

Discussing basic problems in building British aircraft in the U. S., Scott Hall says the outstanding one is the difference in engineering standards between the two countries—screw threads, standard parts, sheet gauges, and tolerances are all different. Noting that the engineering standards organizations are hard at work on this problem, he points out nonetheless that it took 20 years to attain a unified screw thread.

Scott Hall says that although the exchange of defense R&D information between Britain and the U. S. is progressing satisfactorily "on the whole," there is room for improvement, particularly in areas in which research and development are undertaken by industry. "I do not believe the maximum benefit is achieved because the information does not always reach individuals who may be vitally interested," he declares, adding that this is not primarily due to failure of the circulating machinery. "We quite rightly have to take the utmost care to safeguard security and to protect the proprietory rights of manufacturers," Scott Hall explains.

Discussing the Comet 1, Scott Hall points out that when it first entered scheduled service in May 1952, its speed was roughly half again as much as any contemporary airliner and its cruising altitude was roughly double. "Such increases are rarely seen in aviation," he comments, noting that "even now, over 2½ years since the Comet first went into service, no other jet aircraft is in airline use or near it."

Stewart Scott Hall *was Director General of Aircraft for the British government from 1946 until coming to Washington in 1953 as head of the Ministry of Supply Staff (until recently known as the Technical Service Mission) of the British Joint Services Mission. He has spent 28 years as a government aviation engineering scientist. He has worked at the Royal Aircraft Establishment (Farnborough), the Aeroplane and Armament Experimental Establishment, the Air Ministry, and the defunct Ministry of Aircraft Production.*

Meet the Supersonic F-102A

• CONVAIR BUILDS IT IN ONLY 117 DAYS

BY FRED S. HUNTER

CONVAIR has joined U.S. supersonic plane-makers with its new F-102A, a later model of its delta-wing all-weather interceptor.

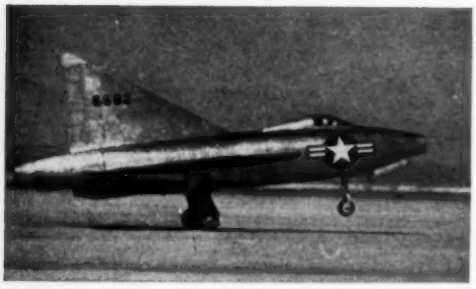
The F-102A, incorporating a number of modifications in the delta-wing fighter's design, was completed at Convair's San Diego plant in the record time of 117 working days.

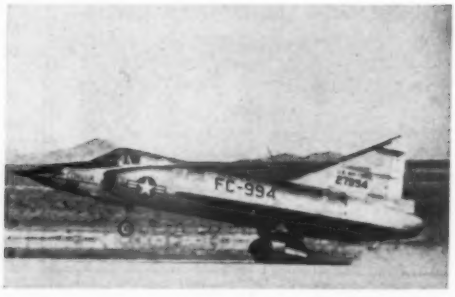
After engine and taxi tests at Lindbergh Field, San Diego, the plane was trucked to Edwards Air Force Base on December 16 for flight tests. After a shakedown flight on December 21, Convair Engineering Test Pilot Richard Johnson next day flew the new plane supersonically in level flight. The plane has exceeded Mach 1 in level flight in subsequent test flights and in addition has flown at 50,000-foot altitudes.

Reports from San Diego all indicate satisfaction with the performance of the new craft.

Principal external difference between the F-102A and the first F-102's that have been flying at Air Force test bases for a year is a longer fuselage and a droop-snoot which also is about six feet longer. Another noticeable modification is in the air intake scoops which are extended vertically and then narrowed with new fairing. After end of the fuselage is distinguished by two streamlined fairings. The delta-wing is unchanged except for cambered leading edges and swept-up wing tips. The canopy has been redesigned to give the pilot greater visibility. • • •

AFTERBURNER OF THE MACH I PLANE





COMPARISON: Newest U. S. supersonic fighter, Convair's F-102A (right and above) is shown with Convair's original delta-wing XF-92A (center, left) which made its maiden flight in 1948.

BENDIX RUSHING DECCA NAVAIDS

BY WILLIAM D. PERREAULT

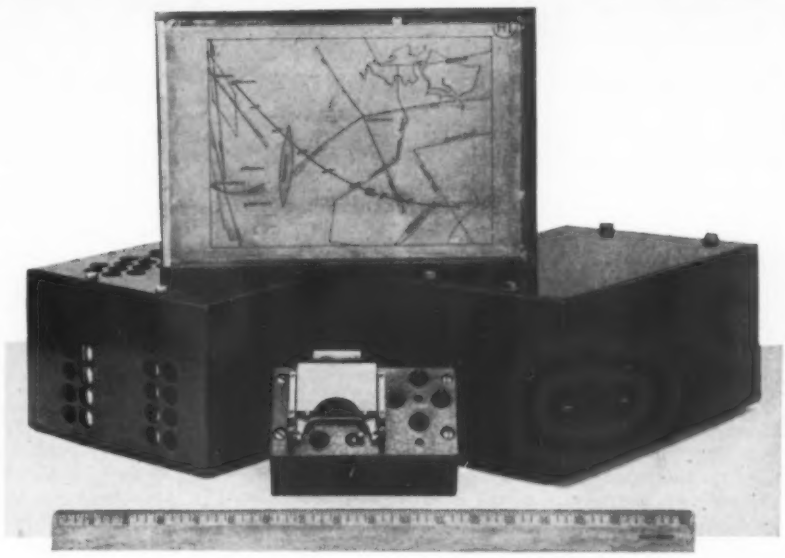
INDICATIONS are growing that Decca, the low frequency navigation aid used extensively for marine and aviation navigation in western Europe, will soon get service tests in this country. Pacific Div. of Bendix Aviation Corp., which recently purchased license rights to a family of Decca patents, is rushing completion of three pilot sets of Decca's lightweight helicopter navigator. These should be completed within 60 days and ready for service tests.

Although there is nothing official as yet, it now appears that Bendix has accomplished in a matter of months what Decca Navigator System, Inc. has been unable to do in the past five years. For at least this long, Decca has owned land sites in New York for trial installation of the low frequency navaid, but has been blocked from actual testing by the Federal Communication Commission's refusal to grant operating frequencies.

Speaking in Baltimore recently, a top Navy spokesman in the electronics field assured the industry that Decca would soon be tested in this country. Officials of the Pacific Div. have told AMERICAN AVIATION that, while there is nothing official regarding frequency allocations, "we feel confident that frequencies for service tests will be made available."

Until the Korean war stepped up helicopter production and operation, there appeared little likelihood that Decca would ever hurdle the technical and political obstacles in the way of service tests in this country. The situation is now sharply changed. CAA's VOR omni-range system, considered competitive with Decca on a world-wide basis, is not capable of doing the helicopter navigation job. Its line of sight limitations, inherent in very high frequency systems, make it useless in low altitude operation.

Civil and military officials have been quick to point out the outstanding characteristics of the Decca-type system for helicopter operation. Operators like New York Airways have worked with Decca Navigator System, Inc., trying to get the experimental installation in New York. British European Airways, which has used Decca for fixed as well as rotary wing aircraft, claims that it is the only apparent solution to the helicopter's peculiar requirements.



The Decca navigation system: simple and lightweight.

Although Bendix Aviation is completely re-engineering Decca to American standards, while cutting down its size and weight, Decca is in itself a long established navigational aid. Six chains (each chain consisting of four stations and covering an area of approximately 50,000 square miles) are installed in the United Kingdom, France, West Germany, and Denmark. More than 2000 sets of receivers are in marine use and most of the world's large passenger vessels, including U. S. ships, use it.

Unlike the British parent organization of Decca, Bendix plans on selling the airborne receivers to the users. Installation of ground stations would be a matter for the operator, and state, or federal government.

There are four ground stations to a chain. These consist of transmitters operating at between 70-125 kilocycles at 400-watts power. The master station is in the center and three slave stations, identified as the red, green, and blue slave stations, form a radial pattern around the master. Each station transmits a signal on a different, but mathematically related, frequency. The transmitted signals form a grid-like pattern over the adjacent area.

The phase of the signal received in the aircraft or helicopter varies in direct relationship to the vehicle's position on the grid pattern. The receiver converts the signals to a common frequency, feeds them into a phase discriminator, and subsequently to the torque device which moves the indicator.

In the lightweight helicopter system, designated the model 352, the indicator is a display unit 12½" x 8⅞" x 1⅜" in size. This is actually a housing for an aeronautical chart printed on a translucent background. Signals from the ground station, via the receiver, actuate a stylus which traces the aircraft's path across the chart. Charts are designed with varying scales to suit terminal and en route conditions, and change-over from one scale to the next is exceedingly simple.

Very similar in presentation to the CAA's pictorial computer unit, the Decca log eliminates many of the shortcomings of earlier Decca systems which required too much work on the part of the pilot. The Decometers, which were once used to provide pilot with position data and which he then had to transfer to the charts, have been eliminated, and lane identification, a method used to eliminate system ambiguities, has been made automatic. Another improvement has been design of a mechanical memory device which stores in-put signals in the event the stylus reaches the edge of the chart. When the new chart is put in place, the stylus takes up its proper position without adjustment by the pilot.

The entire helicopter system weighs only 36¼ pounds. This includes 16 pounds for the receiver, 14 pounds for the power supply and torque converter, 5½ pounds for the display unit, and ¾ pound for the control box. Bendix may cut these weights even further.

While the present Decca system is primarily an en route and terminal area aid, the parent company is working on an approach meter which would provide altitude data and permit a graphic presentation of the landing comparable to the ILS. • • •

Continued High Employment Predicted

THE GROWING importance of the aircraft manufacturing industry to the nation's economy was highlighted at the year's end as DeWitt C. Ramsey, president of the Aircraft Industries Assn., revealed that the industry had become the country's largest employer during 1954. The mark was reached last January, said Ramsey, when over 830,000 were on industry payrolls. The figure later slipped to under 798,000.

Such slippage will go on, cautioned Ramsey, through 1955, but overall prospects for the industry are far from gloomy. The stability that formed an outstanding characteristic of the industry during the year just past is expected to continue. Sales of the 12 largest airframe manufacturers were $5.12 billion in 1953, rose to $5.3 billion in 1954, and are expected to ease off to around $4.8 billion in 1955.

Employment is expected to continue at a high level, close to 755,000, as some 10,000 units are produced for the military alone. Between 10,500 and 10,800 were manufactured during 1954. The commercial transport market absorbed 325 units in 1954, leaving only 175 unfilled orders for large commercial types on the books at the end of the year. Civil helicopter production is expected to hit a new high.

The gradual downtrend mixed with a general high level of business also showed up in the electronics industry. Half of the $5 billion business was military, according to the Radio-Electronics-Television Manufacturers Assn. Although deliveries were down about 10%, electronics amounted to a larger proportion of total armament expenditures.

Elsewhere on the business scene:

• **Lockheed Aircraft Corp.** received a trio of orders: $38.7 million for WV-2 radar picket planes (number undisclosed), $2.34 million for T-33A trainers, including spares, and $1.73 for P2V anti-submarine aircraft spare parts.

• **Hughes Tool Co.** will perform over $28 million worth of work on fire control systems for the USAF; contract involves parts, modification, inspections, and repair, through Aug. 1955.

• **Curtiss-Wright Corp.** Electronics Div., will build an undisclosed number of simulators for Douglas C-118A, Lockheed C-121D, and Convair C-131 aircraft under the terms of a USAF $6.39 million contract.

• **Western Air Lines** has ordered five Douglas DC-6B's for delivery in 1956 at a price of $6 million, with financing to be handled by a group of western banks.

• **Shell Oil Co.** will supply piston engine oil to Pratt & Whitney Aircraft, plus 50% of P&W's jet fuel, at a total cost of over $2 million.

• **Sundstrand Aviation Div.** of the Sundstrand Machine Tool Co., Rockford, Ill., has received a $5.1 million contract from the Navy for acquisition and installation of machine tools.

DIVIDENDS

• **Kaman Aircraft Corp.** paid its first dividend Jan. 15 to stock of record Dec. 31. The 10¢ dividend went to holders of over 300,000 shares of stock.

• **Jack & Heintz, Inc.,** will pay 20¢ per share on common stock on Feb. 1 and a regular quarterly dividend of 50¢ per share on cumulative preferred stock, 4% series, on April 1.

PROFIT AND LOSS

• **General Dynamics Corp.** expects 1954 sales to exceed $600 million. Backlog on Sept. 30 was $923 million, with another $410 million under negotiation.

• **Pan American World Airways** reports a gross volume of about $226 million, including mail pay, during 1954, up from 1953's gross of $218 million. Passenger revenue was up 9%, and cargo revenue 14% (up 25% trans-Atlantic).

• **Western Air Lines** expects a net income of $1.90 or $2.00 per share in 1954, up from 1953's $1.66 and the previous year's $1.72. WAL president T. C. Drinkwater described the prospects for the future as "extremely encouraging."

• **Cessna Aircraft Co.** reports a net of $2.2 million for fiscal year ended Sept. 30, in comparison with 1953's net of $1.1 million. Sales rose from $43.5 to $45.1 million, with military business tipping the scales. Military backlog at the beginning of December was almost $34 million.

• **Northwest Airlines** netted $81,000 in income from operations during November, compared with a loss of almost $220,000 for the same month in '53. For the first 11 months of 1954 the operating net was almost $2 million, in contrast to $1.4 million for the same period in 1953.

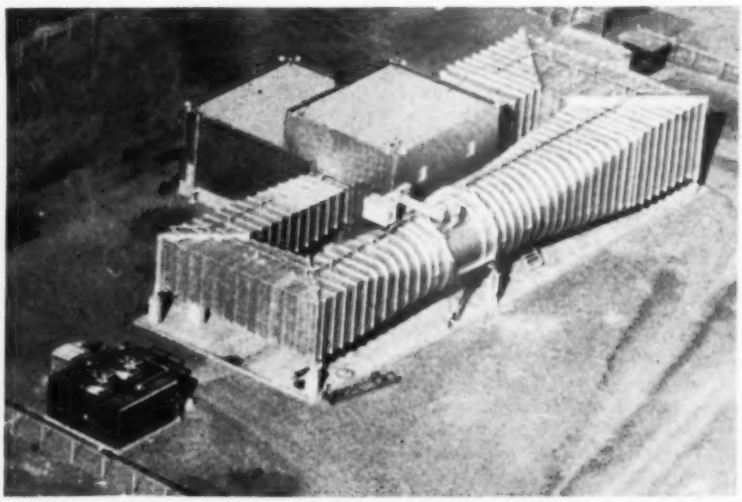
• **Capital Airlines** reports earnings for the first 11 months of 1954 totaling $1.2 million, down from $1.4 million for the same period in 1953. Revenues rose over $2 million, but expenses rose over $3 million.

• **Bell Aircraft Corp.** sales of commercial helicopters rose 20% during the year just past, with total commercial billings, including spares, up 32%. Foreign sales made up 70% of the buiness.

FACILITIES

• **Minneapolis-Honeywell Regulator Co.** has opened a new engineering center at 1915 Armacost Ave., West Los Angeles, for work on missiles and aircraft control systems.

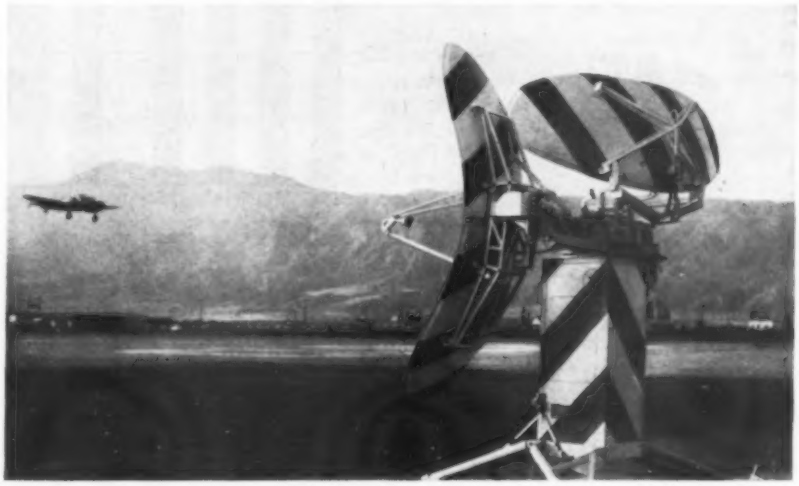
• **Sperry Gyroscope Co.** has set up an aeronautical equipment division at Great Neck, N. Y., site of its main plant.



CHANCE VOUGHT Aircraft's new $900,000 low-speed wind tunnel—only complete low-speed installation in the southwest—will begin operations this month. A 20-foot Sitka spruce fan, driven by a 1500-hp electric motor, has registered wind speeds up to 265 mph.

AVIATION EXPERTS FROM AROUND THE WORLD SEE GILFILLAN GCA QUADRADAR DEMONSTRATED

Representatives of the Royal Canadian Air Force, the Royal Australian Air Force and the United States Air Force were among the many groups attending the field demonstrations of the new Gilfillan GCA Quadradar during November-December, 1954. Also witnessing the performance of the perfected equipment during this period were authorities from the French Air Force; the Spanish Air Force; the International Civil Aviation Organization, representing 63 countries; all Commands of the United States Air Force; United States Navy BuShips, BuAer and CNO; and the Civil Aeronautics Administration.



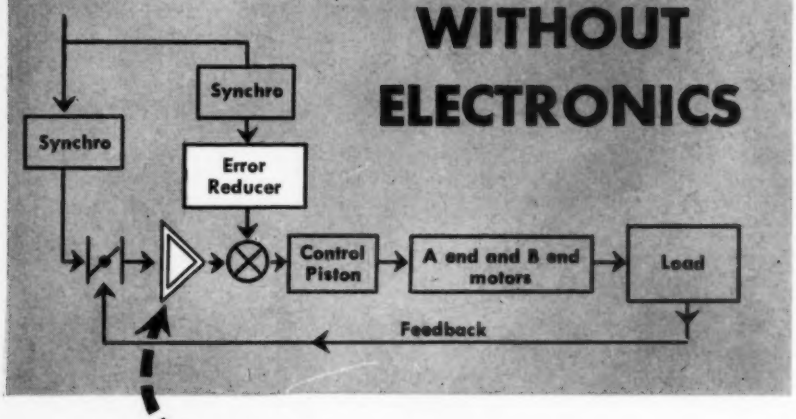
Over 200 aviation authorities attending the recent field tests agree the Gilfillan GCA Quadradar more than fulfills advance predictions of remarkable versatility. Arousing most comment was the clear demonstration that the new 4-in-1 equipment enables a single operator to handle multiple aircraft in a complex traffic pattern including emergency landings. Favorable comment also included the greatly increased definition and expansion of the precision approach display afforded by the new Beta Scan Azel scope developed by Gilfillan; instant rotation of antennas to serve desired runway remoted to operator's position; built-in circular polarization, eliminating rain and snow clutter; and, with the height-finding display, the location and checking of jet aircraft at 47,000 feet. The United States Air Force is now completing evaluation tests of the new equipment.

IN PRODUCTION. *Delivery:* 10 Months from Date of Order

GCA RADAR AND ELECTRONICS
Gilfillan
LOS ANGELES
AROUND THE WORLD

SINCE 1915 LEADERS IN AUTOMATIC CONTROL

FROM SYNCHROS TO 150 HP WITHOUT ELECTRONICS



HYDRAULIC AMPLIFICATION

Ford engineers have developed a highly accurate synchronizing gun drive that is amplified from a small synchro motor to 150 horsepower purely by hydraulic amplification. With the addition of the Ford-perfected Error Reducer, the drive controls the power to train and elevate the guns, thus achieving continuous aiming of the guns with extremely high accuracy. Full use is being made of this experience with hydraulic servo gun drives in Ford's current work on reactor controls.

This hydraulic amplifying system is typical of the unusual amplifying systems developed by Ford Instrument Company over the past forty years. Other examples are the electronic amplifier circuits in mission control computers for the Navy Bureau of Aeronautics, magnetic amplifier circuits for power drives, and transistor amplifiers for missile guidance systems.

If you have a problem in control engineering, Ford Instrument Company's forty years of experience in high precision design and production will help you find the answer. 39

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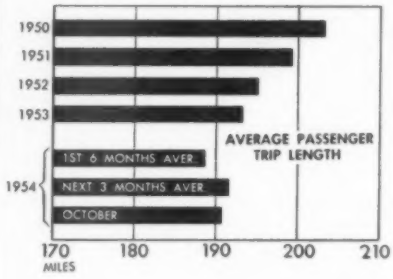
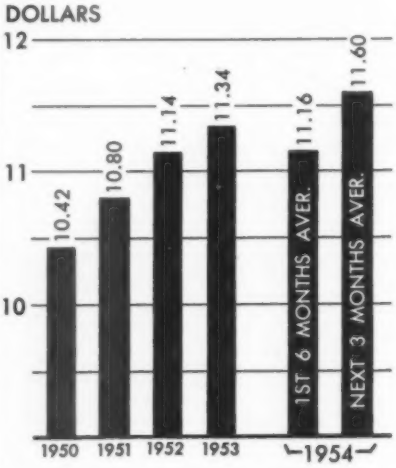
PULSE OF THE INDUSTRY

- **Local line trips get shorter**
- **Passenger revenues increase**

AVERAGE TRIP length per passenger traveling the routes of the local service airlines has steadily declined since 1950, while at the same time, the average revenue per passenger has increased. The accompanying graphs indicate more people are using the local service lines for short trips, as well as for travel to connect with



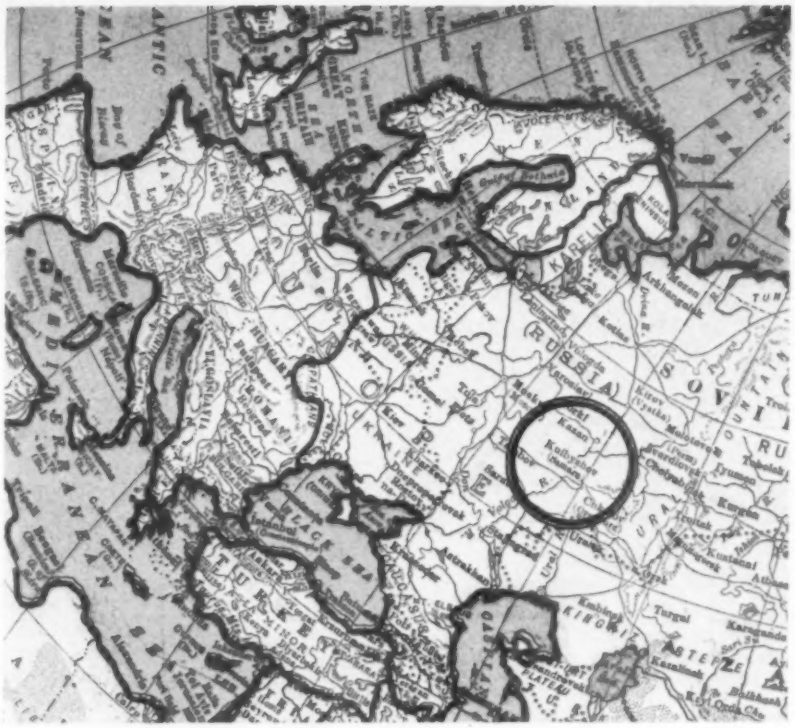
trunk airlines. Although the figures show increased acceptance of the local service airline's role, they also point up the problem of the relatively small base for spreading unit costs.



AVERAGE LOCAL SERVICE REVENUE PER PASSENGER

Unit cost, as applied to passenger handling, has a marked effect on a carrier's ability to make money. When applied to ticketing, for instance, the unit cost (cost of ticketing divided by the number of miles in the trip) per passenger making a 200-mile trip is just about double that for a 400-mile trip. Most common solution—raise all fares and let the long haul help support the short haul.

Source: Official CAB reports.



Circled is one of Russia's most important industrial cities.

KUIBYSHEV: Soviet Aircraft Center

KUIBYSHEV is now one of the largest and most important centers for military aircraft production in the Soviet Union. Not only the Mikoyan MiG-15, MiG-19 and the more recent MiG-17 jet fighters are mass-produced there, but also modern jet bombers, instruments of all kinds, gun and bomb sights, aircraft armament and, above all, engines, including turboprops and rocket motors.

Kuibyshev, formerly called Samara, has become a city of half a million inhabitants. It is located at the confluence of the Samara and Volga Rivers, approximately 400 miles northeast of Stalingrad and is one of the twenty largest cities in the Soviet Union.

The city's industrial plants were constructed as part of the second Five-Year-Plan in 1937 and much has been done since.

Even during the World War II the city surpassed the aircraft center at Moscow in importance. In 1939 the construction of two underground plants in a rocky region had begun and nearly all standard Yakovlev, Lavochkin and Mikoyan fighters were produced there during the war. The output of the Ilyushin Il-2 and Il-3 attack aircraft and, after the war, the additional production of the improved Il-10 Stormovik at Kuibyshev were considerable. During the war, the city became the center of the "Volga" aircraft armament group which contributed up to 60% of the total aircraft production to the air force.

The production of airframes as well as the development and production of engines play an important role today. In addition, the output of accessories at this center should not be underestimated.

During the first years after the war, the development of new industrial centers and the improvement of already existing centers were begun in the central part of Siberia and in the Far East. The importance of Kuibyshev grew nevertheless. It is the only aircraft industry center in the world where Russians, Americans, and Germans have worked in succession and, at times, simultaneously. American aid was concerned primarily with the organization and modern equipment of the airframe plants while the German influence was directed at improving the manufacture of certain jet aircraft and engines.

Three motives led to the establishment of the Kuibyshev industrial center. For one thing, the city was outside the reach of air attacks in 1937. Furthermore, its favorable location with respect to communications, along the most extensive inland water route of the Soviet Union, was a decisive consideration. The third reason is that the new center lies in an area of raw materials offering many potentialities for development.

During the Second World War, the aircraft and engine plants at Kuibyshev were among the largest in the world. At that time, however, the output of these plants was not commensurate with their size, so that a reorganization of their operation, under American direction, became necessary in 1942. Final aircraft assembly was affected primarily. At this time, the important Frunze plant for aircraft engines had neither electric lighting nor coal heating. It depended on natural gas exclusively.

Frequent interruptions were inevitable, since some of the machine tools stood on gypsum foundations and others were operated without any foundation at all. The food supply, even for the trained personnel, could not yet be assured. In 1947, serious brawls broke out among the city population standing in line before the bread shops.

Two important events occurred in 1946. Between 500 and 600 German aircraft designers and scientists arrived in Kuibyshev from occupied Germany. With them valuable shipments of equipment from German aircraft factories arrived. Kuibyshev thus obtained its first new machine tools since 1939. The second important event was the switch to the construction of jet planes and turbines. From 1946 to the middle of 1953 German specialists carried out this change-over which probably would not have been effected so quickly by the Russians themselves. The experts and scientists were housed together in a new settlement which was built especially for them near Krasno Klinka, about 10 miles northeast of Kuibyshev, out of Finnish wooden houses received as reparations. Under German direction the plants doing precision work began to produce modern gun and bomb sights.

The development of aircraft by the German groups did not take place at Kuibyshev, but at the ZAGI Institute at Moscow-Ramenskoye, Moscow-Chimki and Podberesye. However, the development of gun and bomb sights and, to some extent, also that of turboprops, rockets and jet engines, was centered in and near Kuibyshev. Other technicans worked on Russian development of the Walter rocket motors. As soon as the Russians were convinced that the new planes, engines and sights were ready for mass production, nearly all Germans were transferred elsewhere or returned to Germany.

The switch to the production of jet planes and turbine engines took place in 1946. The most important aircraft plant at Kuibyshev, Stalin Plant No. 1, was the first Russian plant to

undertake the mass production of jet fighters. By the end of 1950, this plant had already achieved a monthly production of 68 jet fighters. The MiG-15 and later the improved MiG-15bis and MiG-15C were made there. Today, production has been switched to the more recent MiG-17. In addition, a single-engined and single-seat jet fighter, the Yak-23 (introduced as a fighter-bomber in the satellite countries) is being built.

In 1953, production at Plant No. 1 is said to have been 50 Yak-23 planes and 30 MiG fighters per month. The Yak-23 is an improved version of the Yak-15, which is becoming obsolete, with a more powerful jet engine. The Voroshilov (formerly Ordzonikidze) Plant No. 18, which is adjacent to Plant No. 1 to the north, produced a single-engine attack aircraft, the Ilyushin I1-10 Stormovik (still used in Korea), until December 1950. At that time 30-35 planes monthly were rolling out of Plant No. 18. The most important production sites are underground and in the vicinity of the city.

Due to tight security, not much information regarding these facilities has become known. The new medium Badger jet bomber (Type 37, also called the EF-150 bis) is produced here. In addition, four-engined medium bombers and long-range reconnaissance aircraft are being built in one of the underground plants.

During the last few years two-engined commercial planes of the Ilyushin I1-12 design have also been produced at Kuibyshev.

The Savot Frunze engine plant is one of the most important in the Soviet Union. Like plants 1 and 18, the Savot Frunze plant also has its own railroad connection. A dozen or more test centers operate there on a 24-hour schedule. The plant carried the number 24. Formerly piston engines were produced and for some time now single parts for turboprops have been turned out. Jumo turboprops are tested there. Certain single parts for Walter rocket motors are produced there also, but they are assembled and tested elsewhere. The M-022 turboprop destined for installation in a four-engine bomber or long-range reconnaissance plane is assembled in an underground plant nearby. The aircraft type is the Mi-13, also called Type 31.

South of Kuibyshev and on the southern bank of the Samara River two test centers are available for this 5,500 hp turboprop. One of these test centers is located at the northwestern corner of the Kryash airport, the other near the small town of Batraki. The former center was directed for a time by the well-known inventor of the Russian Katyusha rocket missiles, Andrei Kostikov.

In addition to the M-022, the M-012 turboprop and purportedly a double turboprop are also tested here. The "state run" (the official tests for acceptance by the government) took place late in the summer of 1954. The design of this turboprop essentially follows the model of the German design for a 14-stage axial flow turbine. The performance data vary from 5,500 to 6,800 hp.

The improved Walter rocket mentioned above is being produced at a completely reconstructed plant at Kuibyshev-Besemyanka. This confirms earlier reports that the Soviets are mass-producing at least one rocket-motored interceptor.

Besides these more recent developments, the Rolls Royce Nene imitation (called the WK-1 or RD-45 in the Soviet Union) has been in quantity production for some time now. In 1951, a Russian engineer estimated Kuibyshev's contribution to the total engine production of the USSR to be 8% to 10%.

Two plants must be mentioned here first of all: the Kinapp optical plant which, officially, produces only movie equipment, but actually turns out mainly gun and bombsights; and an aircraft armament plant. At the Kinapp plant, gun and bombsights are produced on the basis of designs developed by the German Askania Works. The REVI 16-B reflector sight is one of them. Only the designations of others, such as the N-3A and PRP-1A sights, the OP-21 sight and the NK PB-3 bomb sight, are known. In addition, electrical remote controls for aircraft cannon and machine guns are produced there. The personnel consists of about 800 workers.

The Kinapp plant cooperates closely with a plant located northeast of central Kuibyshev. The latter produces 30, 37, 50 and 53 mm air cannon.

Kuibyshev is not only an industrial center, but also an important air base with numerous airfields. A technical aviation institute in the city trains industrial technicians and members of the air force.

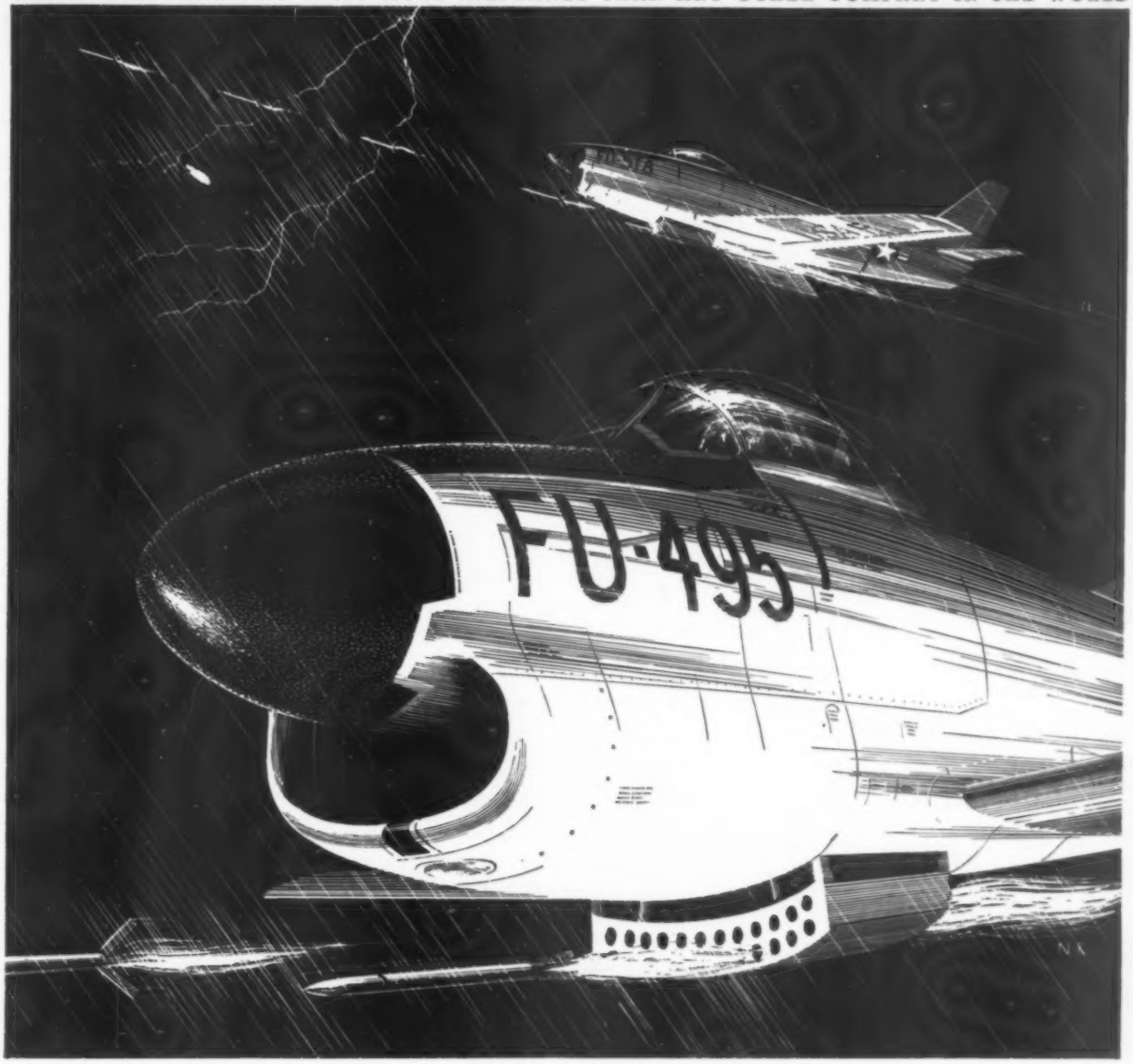
The Kuibyshev aircraft plants are "lead" plants which repeatedly have been the first to produce new designs. Later, there are turned out in simple mass production plants not equipped with development and testing facilities.

What's Building at Kuibyshev . . . and Where

Plant No.	Name	Production	Monthly Output*	Remarks
1	Stalin	Jet fighters, MiG-15, MiG-17 and MiG-19; Yak-23	60 to 68 (1953: 50 MiG and 30 Yak-23	Development plant and mass production
11	"Traktordetail"	Carburetors, pumps, instruments		Older plant at the confluence of the Samara River
18	"Voroshilov" formerly "Ordzonikidze," in Kuibyshev, eastern part	Attack aircraft	Yak-23? Formerly: 11-10	Adjacent to Plant No. 1; joint plant airfield
24	"Frunze"	Turboprops, parts of rocket motors, formerly piston engines		The plant possesses at least a dozen testing centers
27?	"Automobile factory"	Instruments; repair work		Transferred from Leningrad during war
42?		Aircraft parts		Underground aircraft plant
	Kuibyshev-Krasno-Klinka	Jet engines, probably RD-45F	Over 300	Underground engine plant
		Aircraft armaments, 30, 37, 50 and 53 mm caliber		Independent range
	Kuibyshev-Kriash	Testing center for turboprops and rocket motors		On the grounds of the airfield of same name
	Kuibyshev-Batraki	Engine test center		Similar to Kriash
	Kuibyshev-Besemyanka	Engine plant; rocket motors		New plant outside of Kuibyshev
	Kuibyshev-Kinapp	Optical equipment, gun and bomb sights, remote controls for aircraft armament		800 employees

* Data on capacity for the end of 1951.

NORTH AMERICAN HAS BUILT MORE AIRPLANES THAN ANY OTHER COMPANY IN THE WORLD



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ENGINEERING AHEAD FOR A BETTER TOMORROW

NORTH AMERICAN AVIATION, INC.

Exclusive Interview

with

DON R. BERLIN

President, Piasecki Helicopter Corp.

THE FUTURE OF THE ROTARY WING

MAN ON THE COVER

Don R. Berlin, president of Piasecki Helicopter Corp. since Jan. 1, 1953, has had 30 years experience as an aircraft engineer and executive. He has been vice president and general manager of McDonnell Aircraft, having joined that firm in 1947 as vice president in charge of engineering and contracts, rising in 1949 to executive vice president then general manager.

A native of Romona, Ind., and a graduate of Purdue University, Berlin began his career in the engineering division of the U. S. Army Air Corps in charge of wind tunnel tests on many airplane designs. After five years, he joined Douglas Aircraft in 1926 where he became project engineer on a twin-engine Navy torpedo plane. In 1929, when he resigned, he was Douglas' chief draftsman.

From there, he became chief engineer of the Valley Manufacturing Co. of Glendale, Calif. where he designed an eight-place, three-engine aircraft used for an air mail route in Guatemala. From 1929 to Oct. 1931 he was chief engineer of the Northrop Aircraft Div. of United Aircraft. He later joined Stearman at Wichita when UAC disbanded Northrop, but rejoined Northrop as chief engineer when it was established as a separate corporation.

From 1936 to January 1947, he served as project engineer on the P-36 for Curtiss-Wright, later as the company's chief engineer; at General Motors he was on the staff of the executive vice president, later as director of the aircraft development section and director of Allison's installations section.

He is a member of SAE, AHS, and a Fellow of IAS. He received an honorary doctor of engineering degree from Purdue in 1953.

Q. There have been periodic reports of Piasecki engaging in merger discussions with other aircraft firms. What is the present status?

A. There have been a number of rumors to that effect in the past several months. How they started, I don't know, because we have not been seeking a merger. Our helicopters are of good design, we have developed a good manufacturing organization, and we feel that the helicopter field has a most promising future. We are perfectly content to get along as an independent company.

Q. What about license agreements?

A. At the present time we are interested in license agreements for foreign sales and are in the final stages of negotiation on one. Areas of interest are Europe, Australia, South America, and Africa. We are not considering manufacturing licenses at this time.

Q. Is there anything on the foreign scene that you might be interested in building here?

A. We have looked at some experimental designs—particularly a French product and a British product. However, there are experimental projects in this country which almost parallel them.

Q. Are they all helicopters or are some of them convertiplanes?

A. One, I believe, is what might be considered in the convertiplane field—the British Fairey Rotodyne. However, it was almost a duplicate of one under construction experimentally in this country. I could not see getting into it at this point and starting another experimental project on the same thing. I think it saves time and money to find out what happens on current projects before starting parallel projects.

Q. How do you feel about the Army proposal to loan helicopters to the airlines?

A. I think it is a good plan and should be carried out. It would undoubtedly result in real benefits for everyone concerned. This form of accelerated service test under closely controlled conditions will permit early determination of deficiencies and rapid corrective action. However, there may be some question as to whether controlled airline operation would develop the problems that will be developed in military operation. On the other hand, there are a lot of things that would be found out from the commercial operation that you wouldn't get from the military.

Q. What is the status of the certification of the H-21?

A. The various preliminaries have begun. We hope to actually get started on the certification program in the near future.

Q. What would certification of the H-21 cost?

A. Our estimate, assuming that we can go right straight through the program, which I think may be asking a little too much, would run about $450,000, with the Army supplying the helicopter and the spares. This is just the actual flight test, engineering costs, etc.

" . . . there is a substantial commerical market . . . "

Q. When do you expect Piasecki can come up with a satisfactory commercial model?

A. The first step in that direction is the H-21. The H-21 actually, when certificated, will carry a passenger load somewhat greater than that of the old DC-2.

The next step, as far as we are concerned, is the H-16, which gets into the passenger seating capabilities of a Convair or Martin, seating comfortably about 40 to 50 people and carrying a very substantial payload for short haul operations. It's actually a five-ton-payload helicopter. We have two H-16's in operation. The first (YH-16), is flying and is powered by reciprocating engines. The second (YH-16A), which is going through ground test qualifications, is powered by two Allison T-38 shaft turbine engines and is scheduled to fly this spring. We are under contract for the conversion of the YH-16 to a much higher powered version. This involves redesign of dynamic components to receive higher powered shaft turbine engines which will power the production version.

Q. What's going to be the limiting factor on the amount of power you can use with the turbine engines?

A. The present prototype aircraft was designed around the piston engine, the P&W R-2180, which develops 1650 hp. The transmission and the whole dynamic system, including the blades, were designed for 1800 hp. In the second prototype (YH-16A), the Allison turbines develop more than 1800 hp on a standard day. Obviously we can't use it on this aircraft because of the 1800 hp limitation.

On the final prototype and on the production articles, we are designing the dynamic system to take the higher power available from more powerful turbines.

Q. Have you had a commercial market survey covering the H-21?

A. Although we have not made a formal market survey, we feel that there is a substantial commercial market for a helicopter of the H-21 type with the increased payload it will carry over presently available types. Basically, I think our really big market for the use of the helicopter is in undeveloped areas in Canada, Mexico, Central and South America, Africa, Asia, and similar places where there isn't good surface transportation. We have talked to a number of people and, without benefit of a formal market survey, we feel confident that there is enough real need for equipment of this type that we can afford to get it certificated and then go out and develop that market.

Q. You already have a wholly owned subsidiary in Canada. May we ask what its purposes are?

A. It was established to service the HUP and H-21 aircraft which the Canadian government has purchased. This includes fabrication of spares, ground handling equipment, tools, etc., as they may be required.

Q. Are you planning to set up any more of these subsidiaries in foreign countries?

A. I think we will work through agents in other countries. If it came to a question of the Canadian government buying a quantity of aircraft of our design, we would consider expanding our Canadian subsidiary to include airframe manufacturing.

Q. Could you give us some idea on your own production space—how it compares with other helicopter manufacturers?

A. We have in our total facility 830,000 square feet, which includes the Morton plant, our airport flight test facility, warehouses, and the old Autocar plant at Ardmore, Pa. Of this, approximately 360,000 square feet is direct manufacturing area. In 1950, the total area was 160,000 square feet. I am not familiar with exact plant areas of other helicopter manufacturers.

Q. Has it been possible for Piasecki to get on a sound financial footing as a result of the Korean action and subsequent orders?

A. There has been steady and substantial improvement in our financial position since Korea to the extent that the position is very comfortable at the present time. We have not had any cash problems in several years. However, we still cannot finance present and prospective business volume without government progress payments and a government guaranteed V-loan. This is normal in the aircraft industry since it is usually considered unsound to be so heavily capitalized as to make possible the elimination of progress payments or similar government financial aid in periods of peak volume.

The following figures illustrate the progress made since Dec. 31, 1950 and Dec. 31, 1952:

	Estimated 12-31-54	12-31-52	12-31-50
Stockholders' Equity ...	$5,000,000	$2,511,000	$1,121,000
Working Capital	4,000,000	1,517,000	832,000
Long Term Debt	2,600,000	3,904,000	694,000
V Loan Credit	10,000,000	20,000,000	2,500,000
V Loan Borrowings	1,000,000	7,500,000	1,805,000

Q. How have these changes reflected themselves in employment, units of production, pounds of production, production per employee, etc?

A. The following figures will answer that question:

Total Employment	Airframe Lbs.— Ships & Spares	Direct Labor Hrs. Per Airframe Pound
1952 (Jan.) 3368	723,000	3.73
1953 (Jan.) 4869	1,446,000	1.99
1954 (Jan.) 4580	1,508,000	1.42
1954 (Dec.) 3382		

Q. What share of this improvement is due to reduction in general subcontracting?

A. Many items which were formerly subcontracted have been brought back into the plant. We have reduced our total subcontracting ratio, dollarwise and weightwise, from about 80 percent through 1952 to the vicinity of 35 to 40 percent in 1954. As our existing subcontracts ran out on parts not requiring specialized equipment to manufacture we did not reorder, but brought them into our own plant. By the end of 1955 we will be at about 25 percent maximum subcontracting.

Q. What is this doing to costs?

A. Our costs are right in line with the aircraft industry for equivalent quantities. We have made a big effort in that direction, not only in our own internal work but on our outside procurement. At this point we are competitive, costwise, with anyone in the business.

Interview from page 31

"the big market . . . isn't airline operations."

Q. There were stories around the industry that Piasecki's costs have been around five times that of some of its major competitors.

A. That figure may have some basis, but there are a number of things you have to look at when making such a statement. Piasecki has always produced big helicopters and the tendency has been to compare unit cost of these big vehicles with those of smaller helicopters. However, it can be stated that our costs were too high. For instance, H-21's built under the first contract have cost about double what the follow-on contract will be—in part due to development costs having been absorbed. We took the follow-on contract on a firm target basis to demonstrate our position that costs would be controlled and prices quoted are in line with industry experience.

Q. It is generally considered that Piasecki is a manufacturer of large helicopters. Can you cite the validity of this impression?

A. Yes, PHC is a manufacturer of large helicopters. In fact, the 10- to 12-place HRP-1 (1945), the 16-place YH-21 in 1952, the 22-place H-21 B&C in 1954, and the 40-place YH-16 in 1953 have all been "firsts" in size and in load-carrying capacity. Piasecki has also been first to put each of these advanced models into production.

Q. Do you have a convertiplane in the works?

A. We are working on initial steps of such a project. We don't have a complete convertiplane project, but have certain experimental work leading toward such a project.

Q. Do these plans envision a truly large convertiplane, in line with your large helicopter policy?

A. No, I think that we would be stepping out a little too far initially. One the size of the H-21 might be feasible.

Q. Does the convertiplane field look promising to you?

A. Theoretically, the convertiplane offers quite a lot. Practically, I think we had better get busy and make the helicopter itself a good substantial operating vehicle before we step too far out trying to cross it with the high-speed airplane. It is all right as a research and development operation at this point, but for us to hang our hat on it as something we are going to have in production in the near future is wrong. There is a lot yet to be done with the pure helicopter. It still hasn't been developed to the point where it can do a good efficient job all around—to the same degree, for instance, that the DC-3 did. There isn't any helicopter today that can be looked at in the same light as the DC-3.

Q. There is some opinion in the helicopter industry that maybe two engines aren't enough; maybe four turbines should be used.

A. We have studied several multi-turbine installations in the H-21. There are advantages and disadvantages of two- and four-engine installations. There is such a thing as too much complication in multiplying powerplants for a given size of aircraft. It would seem to me that for an aircraft the size of the H-21, a twin-turbine arrangement might be all that is necessary, assuming you get the size turbines that are needed.

Q. Would you give us an idea of the price of the commercial version of the H-21?

A. I estimate that we will be in a position to deliver H-21's commercially in early 1956. Continuing military deliveries will result in continuing airframe cost reductions. The commercial price will be approximately $250,000 to $275,000 fly-away, depending upon the amount of equipment and furnishings such as radios, seats, soundproofing, etc., required by the customer.

Q. Have you encountered any real interest from anyone in a commercial version of the H-21 in this price range?

A. We have had many inquiries and firm interest from many areas.

Q. What will an aircraft such as this one we are talking about gross and how many passengers will it carry?

A. It would weigh approximately 13,300 pounds and seat between 16 and 21 passengers, depending upon the type of operation and required range.

Q. Have you worked out any operations costs for the benefit of interested commercial customers?

A. We have made some studies for the military and some projections in commercial operations. I think, in that regard, the big market for commercial usage of helicopters isn't airline operations. That will be part of it, but the big use of the helicopter is in areas where there are no other means of transportation. It is for operations of this type that the helicopter is ideally suited and, therefore, the actual cost per hour of operation, as compared to airline operating costs of fixed wing aircraft, doesn't mean much.

Q. Are you generally satisfied with the current military procurement policies on helicopters?

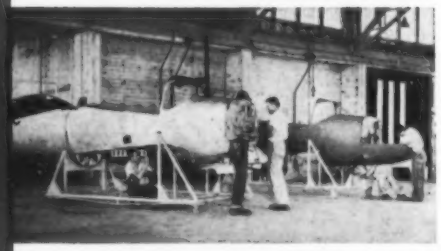
A. Actually, the biggest problem confronting us today isn't military policy in regard to what they are going to buy in the way of helicopters, or specifications for them. Today, we would be building to a high percentage of our capacity if we were not confronted with this vibration problem. In my opinion, the whole rotary wing industry has had a total lack of appreciation of the magnitude of the vibration problem and how to correct it. We have, by an accelerated but extensive investigation during the past four months, determined sources and effects of vibration on the aircraft. We have been able to reduce the vibration by more than half on production H-21's and expect even greater improvements in the near future.

Q. What approaches are being used to minimize vibration?

A. There are two things we have done to provide a real reduction in vibration level. One is better quality control of the rotor blades. Second is improved dynafocal mounts for the engines. Adequate attention hasn't been given the engine mount problem. So we have made some changes in engine mounting, particularly in the H-21. There will be further changes made, but these two items have been the major contributors to excessive vibration. Now that we have a finger on the problem, the vibration level has been greatly reduced.

(Continued on page 34)

Electronic Weight Check



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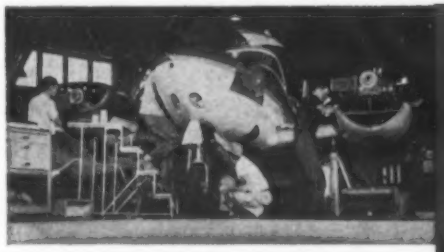
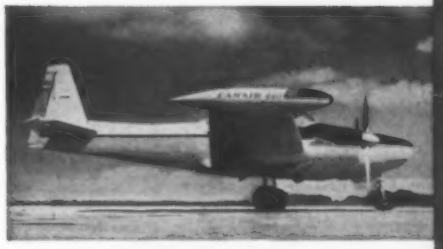


Twin Engine Installation

Final Factory Inspection



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Interview from page 32

"... design of rotor blades cannot be divorced ..."

Q. Could you be more specific on what is being done on the H-21?

A. One phase of this vibration reduction program is to determine the feasibility of rotor isolation. In such a design we have the rotor transmission, rotor, and blade assembly mounted in rubber. It is a process which was used successfully seven or eight years ago on a twin-engined, twin-rotored helicopter. We now have an H-21 with rotor isolation installed and we should have some answers quite soon.

Q. Could you give us a brief summary of what the present status of your rotor blade development is?

A. We have had one subcontractor making plywood covered blades with steel spar for both the HUP and the H-21. We have had the normal run of difficulties that go along with wood blades. Generally speaking, our wood blade design has given very good service on several hundred helicopters over the last six years.

We are now building our own metal blades and have considerable flight time on them. This blade is composed of a steel "D" spar with aluminum trailing edge boxes bonded to the spar. Initially we experienced some difficulty in the manufacture of these metal blades, primarily in the process of bonding trailing edge boxes to the spars. However, these problems have been resolved and we are now producing metal blades.

Q. There appears to have been a major realignment in military thinking on rotor blade design responsibility recently.

A. Undoubtedly you are referring to the recent decision that the prime airframe manufacturer shall have cognizance over rotor blade design and quality control. It is sound policy because any effort to divide the responsibility for the design and construction of such interdependent helicopter components will inevitably lead to a division of the responsibility for safety and performance of the whole helicopter. The design of rotor blades cannot be successfully divorced from the design of the controls, transmissions, and the overall fuselage configuration.

Q. There are perhaps 10 or 12 helicopter companies in this country, but only two or three of them are financially healthy. Do you think that pattern will continue or will some of them go out of existence?

A. Well, I think there you have to go back to the fixed-wing aircraft industry. Some of them which started at the same time have grown into large companies while others have fallen by the wayside. I think the same thing will happen in this industry. I believe there is a real desire on the part of the military services to try to help the smaller companies along when they have anything of real value to offer. I think that there is a feeling of responsibility in this direction on the part of the military. I have seen evidences of that at least. Of course, support of any company can't go on indefinitely unless there is evidence of progress.

Q. Are there any basic developments in production methods which show promise of lowering the unit cost of helicopters?

A. Yes, there are many developments showing promise of lower costs:

- Heavy press extrusion for large rotor blade skins reduces machining.
- No-draft forgings for small structural fittings reduce machining.
- Glass-plastic moldings for non-structural and structural surfaces reduce weight and assembly hours.
- Extensive use of reinforced plastic components.
- Application of bonding techniques instead of mechanical assembly.
- Greater use of forgings and castings.
- Greater simplification of design.
- Coordinated holes system for assembly of fuselages.
- Breaking large assemblies into smaller units.
- Elimination of hand operations.
- Plastic tooling.
- Use of martempering to reduce distortions.
- Use of carbide-tipped tools.

Q. Have you any views on the recent IATA suggestion that the helicopter be designed to fit the heliport rather than vice versa?

A. We recognize the need for helicopters to be able to operate safely from small heliports buried in city centers. We believe we will be able to supply a helicopter that can meet the safety requirements involved.

Q. Has there been any study as to what percentage of the helicopter noise originates from the rotors versus the transmission versus the engine?

A. We have made a study on the H-21 and found that muffling the exhaust eliminates the objectionable part of the noise. If the tip speeds of the rotors are low enough it isn't irritating to the eardrums even though there is a beat. I am positive that for commercial operations in the downtown areas we are going to have to muffle the exhaust and take the power loss that goes with it.

Q. How many helicopters have you actually produced to date?

A. In the general neighborhood of 500.

- Frank Piasecki's PV-2—first flew in April 1943.
- The XHRPX—Dogship which was the world's first successful tandem rotored design.
- Two experimental HRP-1's.
- Twenty production HRP-1's.
- Five production HRP-2's.
- Three experimental XHJP-1's.
- 336 production HUP-1's, HUP-2's, and HUP-3's (H-25A).
- Well over 100 H-21's including YH-21's, H-21A's, H-21B's, H-21C's.
- Two experimental H-16's.

Q. Have you encountered any interest from the Air Force in the H-16 with external mounted pod?

A. Yes, there is interest in the Air Force. It is recognized that, in many operations, the use of the pod can result in more ton-miles flown in a given period due to the elimination of the loading and unloading times. Further, the pod can be a self-contained shelter for a communications, or radar, installation or a personnel shelter which can be readily relocated to a new area intact. This could be very useful in Arctic areas. • • •

Inspecting a watch?
No, it's just part of Mainliner maintenance

One of the "sights to see" in San Francisco is United Air Lines' huge maintenance base; there are frequent guided tours, and you're invited.

Here you'd see Mainliners getting scheduled "check-ups" that are marvels of completeness. Engines, instruments, controls, other parts are disassembled and examined as closely as a jeweler would check your watch. (In fact, many of the instrument experts *are* former watchmakers.)

Parts showing even the slightest wear are replaced, and the latest improvements are added, too, regardless of cost. For example, on the average DC-7 overhaul, United spends over $100,000.

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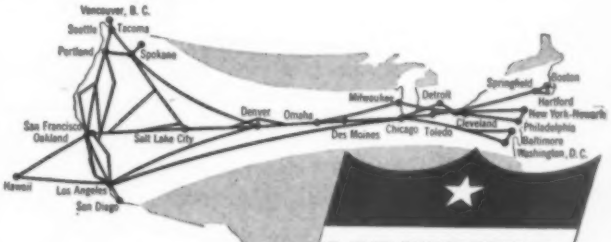

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Trying Times for Hunter and Swift

BY ANTHONY VANDYK

BRITAIN'S TWO U.S.-backed day fighters, the Hawker Hunter and Vickers-Supermarine Swift, are going through a difficult period. Although they are coming off the production lines fast they are slow in coming into service with the Royal Air Force. The reasons for this are both political and technical, and so the aircraft are getting an undeserved bad name in some quarters.

Actually the Hunter and Swift should not be taken together. The Hunter is the No. 1 British fighter while the Swift was brought into the picture as "insurance." In addition to being supported by the U.S., the Hunter has been ordered by Belgium, Denmark, the Netherlands and—significantly—Sweden, which has no NATO ties and therefore clearly selected it on merit. License production of the Hunter is to start this year in the Netherlands and Belgium.

The Hunter program in the United Kingdom originally was based on findings of an inter-services top-level committee at the end of World War II, the committee found the earliest date at which another world war could occur was "after 1956," after taking into account Russia's potential, ability to recover, and acquisitions from defeated Germany and the satellites. The committee reckoned without the defection of atomic scientists or the work of traitors and spies.

The RAF re-equipment program was based largely on this finding, although the program also reflected Britain's postwar economic situation. This resulted in a decision to get along with de Havilland Vampires and Gloster Meteors until a very advanced, fast-climbing Mach .9 sweptwing fighter could be introduced.

The Hunter was designed to the specification with a performance to intercept high-level, fast jet bombers. Meanwhile, Vickers-Supermarine developed the swept Type 510 (unarmed) from the Navy's Attacker, then gave it a long nose and tricycle gear as the 535, finally evolving it into the Swift, with an Avon in place of the Nene. The British government decided that a Hunter "insurance" would be useful and ordered Swifts for the RAF. From the start the Swift was designed for afterburning and the plump (centrifugal) fuselage gave it the stowage.

Shortly before Korea the British government embarked on a big economy drive that reduced Hunter orders substantially until the Korean war began and then a "crash" program was ordered, implementation of which proved difficult because of cutbacks in personnel and equipment that already had taken place.

When Churchill came back into power the "super priority" production scheme was applied to the Hunter and Swift. Delivery began on production Swifts in the fall of 1953 while first production deliveries of Hunters began a few months later. With the deliveries came the troubles.

About 1950, the RAF, through the Air Ministry and Ministry of Supply, sought to economize by delegating development flight testing to aircraft manufacturers' test pilots. This freed the Aeroplane and Armament Experimental Station at Boscombe Down for basic research. The result was that instead of RAF pilots "babying" the aircraft through their teething stages, the Hunter and Swift were almost unknown quantities when received by RAF units. This situation was made graver by the fact that RAF pilots had little sweptwing experience, and that only in the Sabre, which is without the vices of the 40 degree wing.

Aircraft that had been easy for the skilled Hawker and Vickers-Supermarine pilots proved tricky and dangerous in the hands of ordinary squadron-level military pilots.

Both the Hunter and Swift suffer from turn-tightening at high speed, due to wing deflection and wingtip incidence loss. With the Hunter, this trouble is not serious but with the Swift it is. If modifications in hand, involving fitting a "tooth" leading edge, are not immediately successful, the Swift may have to be canceled.

SUPERMARINE SWIFT F4

HAWKER HUNTER

With the Hunter, use of wing flaps as air brakes (often demonstrated effectively at Farnborough), although satisfactory for normal maneuvering, proved to have too great trim change for gun aiming. Attempts to fit fuselage brakes proved troublesome, finally resulting in a small external "door" being installed underneath.

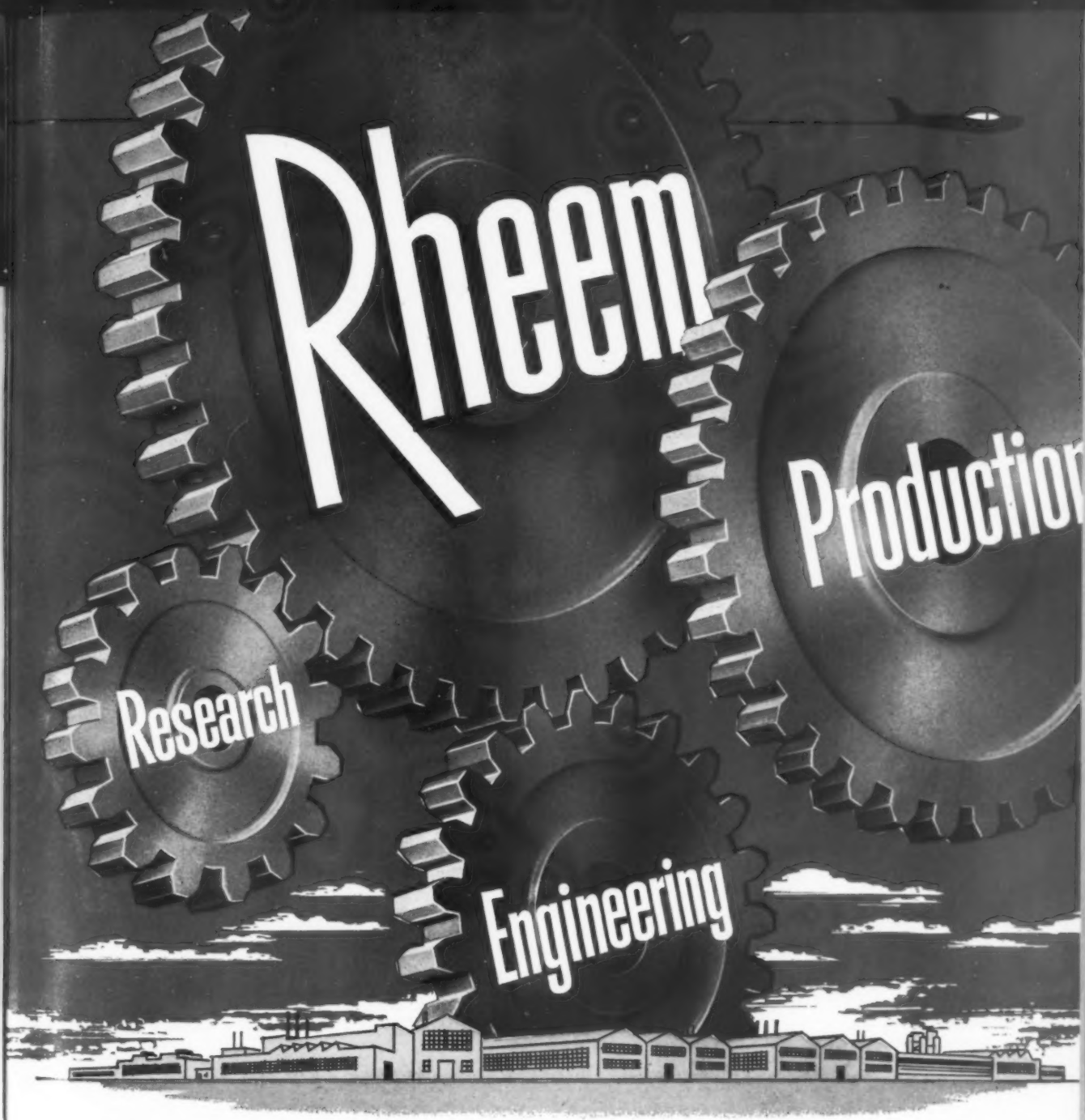
Both aircraft require all-moving tails for full operational efficiency. The Swift F4 has been so equipped and a similar installation on the Hunter has been anticipated for nearly a year. It is the sorting out of these various modifications which has led to a year's delay between delivery and genuine squadron.

MATS Reports On Its Safest Year

Military Air Transport Service during 1954 recorded the lowest transport accident rate in its six-and-a-half year history while carrying an estimated 500,000 passengers and patients plus 90,000 tons of cargo and mail, MATS commander Lt. Gen. Joeph Smith reports. During the year its three divisions—Pacific, Atlantic, and Continental flew 1.5 billion passenger-miles, 100 million patient-miles and 500 million ton-miles.

Ocean crossings numbered 5810 for the Pacific division and about 4000 for the Atlantic group. The combination produced a transocean flight on an average of every 54 minutes and more than 20,000 pounds of cargo and mail airlift every hour.

New aircraft introduced by MATS in 1954 included the Lockheed R7V Super Constellation and Convair C-131A Samaritan. Added to these, its pilots ferried 6900 aircraft throughout the world among which were jet fighter plane deliveries over the North Atlantic in Operation High Flight.



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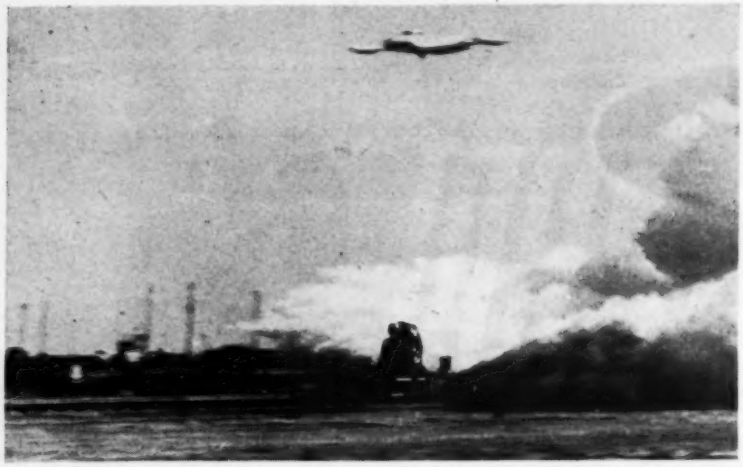

SLED PASSES JET during high-speed run. Lt. Col. John P. Stapp, "the fastest man on earth," roared beneath a jet airplane during his 632-mile-per-hour ride aboard the Northrop-built rocket-sled at Holloman Air Development Center, New Mexico. The T-33 jet airplane was flying above the sled during the high-speed run.

'54 Is Big Year For United Aircraft

With its Pratt & Whitney J57 jet engine now scheduled for seven different AF and Navy fighters or bombers and better than 80% of the world's commercial airlines using P&W piston engines, United Aircraft Corp. observed these year-end division activities:

• **Pratt & Whitney**—Ended its first full year of J57 production, continued to maintain quantity output of piston engines, and had T34 turboprops on three USAF experimental transports as well as the Navy R7V-2 Super Constellation.

• **Hamilton Standard**—Doubled its production volume of aircraft equipment over 1953. Production continued on propellers for DC-7 transports, extending its equipment representation to 90% of all scheduled airlines and 99% of U.S. domestic carriers.

• **Sikorsky Aircraft**—Introduced the twin-engine S-56 Army and Marine Corps helicopter, the Navy S-58, and the gas-turbine-powered S-59 for the Army.

Schroeder Replaced As Minn. Commissioner

Minnesota Governor Freeman has appointed Mitchel Perrizo as commissioner of aernonautics, succeeding L. L. Schroeder who held the post for 12 years. Schroeder's term expired Dec. 31. The new appointment was explained by the governor as his desire to bring "an entirely fresh viewpoint" to the post.

Minnesota has been involved in a growing conflict of opinion over the nature of airport development with the "battle . . . being waged all the way from local units of government to the Department of Commerce and CAA," Gov. Freeman stated.

Perrizo is a former member of the Minnesota House of Representatives and a former chamber of commerce officer. Schroeder is going into private law practice in Minneapolis, specializing in aeronautical law.

Denney Quits Rotor Firm He Founded

Corwin D. Denny, founder of the American Helicopter Co., has resigned as general manager of Fairchild Engine & Airplane Corp.'s American Helicopter division. Paul J. Frizzell, Fairchild vice president, is now in full charge at the Manhattan Beach, Calif., rotorcraft facility. Denney sold control to Fairchild last April.

The company's founder is planning to devote all his time to the presidency of Mid-Continental Manufacturing, Inc., of which he is principal owner. Mid-Continental has facilities at Manhattan Beach and Tulsa.

Look Into Subcontracts Urged by House Group

Subcontractors' complaints about sharp reductions in defense subcontracts is attributable to factors other than just cutbacks in prime defense contracts, the 83rd Congress' House Select Committee on Small Business stated in its final report. The committee recommended a thorough Congressional review of current defense subcontracting procedures.

The report criticized the Defense Department because of its "virtual abandonment of the advertised proced-

More Airliners Allocated to Reserve Fleet

Revised allocation of airline aircraft to the Civil Reserve Air Fleet announced recently by Defense Air Transportation Administrator Theodore Hardeen, Jr. calls for 317 aircraft with a contingency reserve of 25. Previous allocation totaled 308 transports with a 23 airplane reserve.

Breakdown by types of equipment shows assignment of 125 DC-4's, 107 DC-6's, 66 Constellations, and 19 B-377's. Of the total fleet, 290 aircraft are allocated from scheduled carriers and 27 from irregulars.

Here's how specific airlines are represented under the new CRAF program with previous allocations shown in parentheses:

Carrier	DC-4	DC-6/A/B	B-377	Const.	New Total	% of Airline's Total Lift
Alaska	1(1)				1	37.55
American	9(14)	38(33)			47	33.63
Braniff	0(3)	5(5)			5	17.48
Capital	4(4)			7(7)	11	30.99
Continental		2(2)			2	28.93
Delta-C&S		7		(6)	7	18.55
Eastern	11(11)			19(20)	30	29.00
FlyTigers	5(7)	3			8	32.56
National	(3)	7(4)			7	31.39
Northwest	5(6)	5(3)	3(5)		13	33.97
Pac. Northwest	2(2)				2	32.70
Panagra	3(2)	1(2)			4	34.50
Pan American	26(22)		16(15)		42	33.31
Resort	7				7	35.09
Slick		2(4)			2	27.13
TransWorld	6(10)			40(40)	46	33.24
United	20(16)	31(27)	(6)		51	33.98
Western		5(5)			5	28.84
Total	99(101)	106(85)	19(26)	66(73)	290	
Irregular Carriers						
CalEastern	4(4)				4	
North American	2(2)	1			3	
S&W	5(7)				5	
Transocean	7(5)				7	
U. S. Overseas	8(5)				8	

A-C VOLTAGE REGULATORS

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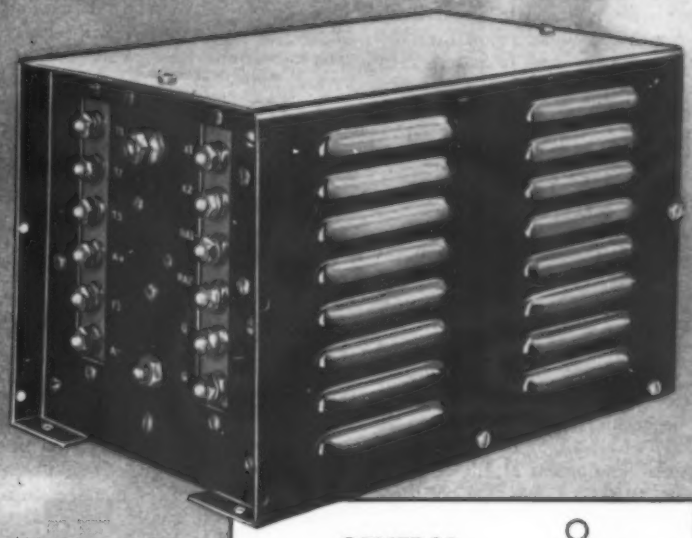

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Contributing to the increased acceptance of J&H "packaged" a-c generating systems for aircraft is a new series of voltage regulators. These units are designed to operate with J&H a-c generators rated from 10 through 120 kva, including: blast-cooled (120°C ambient), thermal lag, and environment-free oil- or vapor-cooled machines. Incorporating reactive load division circuits, the new regulators can be used in either isolated or parallel systems.

Static-Magnetic Design

These regulators feature a completely static design consisting primarily of magnetic circuits offering these important advantages over comparable carbon-pile and electronic-type regulators:

1. Eliminate need for vacuum tubes—means increased reliability, longer service life.

2. No moving parts—maintenance reduced to a minimum.

Jack & Heintz engineering personnel and manufacturing facilities are geared to undertake design and production of complete a-c systems or individual components. We invite your inquiry. Write Jack & Heintz, Inc., 17633 Broadway, Cleveland 1, Ohio. Export Department: 13 East 40th Street, New York 16, N. Y.

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GENERAL DESIGN DATA*

- 115/200 volt, three phase or 115 volt, single phase.
- Frequency ranges of 380/420, 320/480 and 320/1000 cps. Others to suit.
- Regulate generators with power factors from .75 to 1.0.
- Hold voltage to within 2½ volts of rated, under normal operating conditions.
- Hold voltage to within 5 volts of rated, under all operating conditions.
- Return voltage to normal value within 0.18 seconds following removal of system faults or load changes.
- Operate satisfactorily over temperature ranges as wide as −55°C to +120°C.
- Envelope size and weight generally less than required by specifications.
- Mount in any position.

**All J&H a-c regulators are designed to meet the requirements of MIL-G-6099 and USAF Drawing 53D6793.*

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JACK & HEINTZ *Rotomotive* **AIRCRAFT EQUIPMENT**

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ure in preference for purchasing by negotiation," which has reduced the volume of possible contracting with small businesses. The Defense Department has also been criticized for its provision of government-owned equipment to prime contractors, the report said.

Meanwhile, the Senate Small Business Committee's annual report for 1954 is near completion and is expected to cover extensively the small business programs of the military services.

CAA May Operate 15 Navy Radar Bases

Radar installations at some 15 naval air stations may be operated by CAA under an agreement now being discussed by the Navy and CAA. Under consideration is whether such operation would benefit both civil and military airways users.

The program is similar to a plan in effect between CAA and USAF under which radar equipment at 18 AF bases will be operated by CAA. Two of these locations *(MacDill and McChord AFB)* are already in operation and all others are in varying stages of implementation.

First Navy radar destined to come under CAA operation will be a long-range unit (125-150 miles) to be installed at Norfolk Municipal Airport. Navy offer to provide this equipment hasn't been formally accepted by CAA but agreement is viewed as a certainty. The Norfolk radar would play a key part in an overall plan to improve enroute traffic control coverage from Norfolk to Boston.

PROCUREMENT NOTES

• **Air Force supply officers** are learning for the first time the dollar value of serviceable and repairable supplies in their warehouses. The first consolidated report of the Monetary Inventory System shows $11.8 billion in inventory. It is complete except for some overseas depots which will probably increase the total by $2 billion. AMC stores $8.3 billion and the Army holds $1.8 billion of USAF supplies, mostly ammunition.

• **In an interesting breakdown** of type of supplies in inventory, the reports show engines and parts to be valued just below $2 billion. Electronic and communication equipment are the same amount. Instruments and accessories are valued at $1.5 billion. Enthusiastic supply officers say these new figures will enable them to reduce inventory while USAF is still building up combat strength.

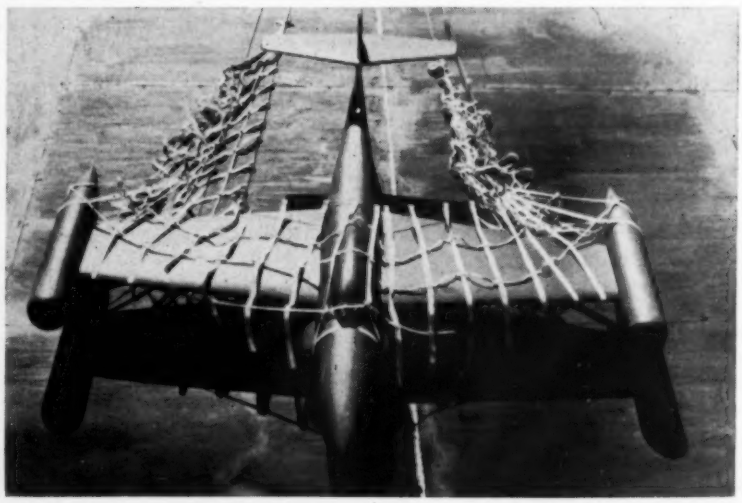
• **New cost allowance principles** now being drafted in the Pentagon change the rules for memberships in trade and technical associations. Contractors are not to be reimbursed for that percentage of the associations' dues which cover "lobbying and public relations activities." Just how this regulation can be enforced without the military auditing trade associations books has not been explained.

• **A special report** of Secretary Wilson's Business Advisory Committee of Fiscal Organization and Procedures calls for a completely new system of accounting for research and development activities. Emphasizing the "necessity for change in current concepts and stating that their recommendations "will require changes in traditional attitudes and thinking, and at all levels within the Services," the 140-page survey endorses the Ridenour Report *(Sept. 1949)*, demands that all indirect costs, such as military pay and materials and equipment furnished, be included in each research installation, urges elimination of multiple allotments, and suggests budgeting accounting and reporting practices that would inspire good management.

• **Admitting that the recommendations** require a complete change from existing procedures, the report suggests a gradual transition to a new system. Highly critical of excessive paperwork, it emphasizes the need for "close relationship between management and fiscal operation."

• **The backlog of letter contracts** is again going down after a sudden spurt in October (the month before election). The Navy has 78 valued at $1,207,000,000. The Air Force has 142 valued at $1,064,000,000. The Army has none. In May 1951 the total of the letters of intent for the three services was over $20 billion.

• **Thirty-nine commercial-type activities** of the Defense Department have installed the industrial funding system of accounting. Laundries may be the second installation in the Air Force. A grouping of eight printing plants over a year ago formed the first installation. The decision on an operational reorganization of MATS is now in the hands of Secretary Talbott. The fiscal reorganization of the airlift activities of MATS will be largely determined by Asst. Secy. Lyle S. Garlock, the new comptroller of the Air Force.

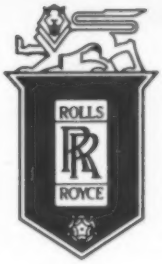


MODEL: Miniature, non-flying jet fighters, 1/10 the size of the F-89 Scorpion yet capable of "ground speeds" of 110 knots, have been constructed by All American Engineering Co, Wilmington, Del., to test the ability of nylon nets to halt safely full-size jets that run out of runway. Nylon barrier used in the tests, like the pint-sized jets, is also constructed to 1/10 scale.

ALPA-AA Go to Wire In 8-hour Rule Dispute

Final report and recommendations of Neutral David L. Cole in the eight-hour flight time dispute between ALPA and American Airlines should be near at hand. Cole scheduled a last meeting with pilot and AA representatives in an attempt to mediate some sort of agreement, simultaneously declaring: "My final report will depend on the outcome of the meeting."

One important stumbling block is believed to be AA's $1,250,000 suit for compensatory and punitive damages against ALPA. Hearing in the case has been set for New York's Federal District Court on Jan. 18. Another obstacle is AA's reluctance to put a third pilot on the non-stop transcontinental DC-7 flights lasting more than eight hours.



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Lear Reveals New Autopilot For Supersonic Fighters

By WALTER A. KILRAIN

AN AUTOPILOT to meet the exacting requirements of the "Century Series" of supersonic fighters, as well as other current types, has been produced by Lear, Inc., and is now undergoing flight tests.

Production speed is predicted for the new unit, designated the L-10, because it incorporates a number of modified components from its predecessor, the F-5, now in the North American F-86D and Republic F-84E. In addition, reliability will be improved and costs cut by the use of such service-tested components, Lear officials forecast.

Features of the L-10 include:

• **Higher accuracy** in control surface positioning, resulting from a servo-positioning loop with 10 times more usable gain.

• **Continuous automatic damping,** even during periods of manual flight when the autopilot is disengaged.

• **Operation from remote gyro references,** leading toward integration of the autopilot with other systems in the aircraft, thereby reducing duplication of equipment.

• **Proper coordination of turns** under all conditions through putting heading information into the roll channel, rather than the yaw channel. Standard practice has been to skid the aircraft by using the rudder to correct small heading errors. With the L-10 such errors are corrected by banking the aircraft in coordinated turns, with a sideslip detector feeding signals into the rudder when necessary.

• **Automatic variation of system gains,** to keep responses consistent with varying flight regimes. To allow for different types of aircraft, as many as six independently and automatically varied gain functions are provided in the L-10 design.

• **Command maneuvering** may be carried out either by manipulating the knobs on the console *(see cut)* or by operating the stick. When the latter is used, the autopilot provides a rate of roll proportional to the force being exerted on the stick. When the aircraft has reached the desired angle of roll and this force is removed, the autopilot holds the plane at the angle achieved. The plane can then be levelled out and locked on the new heading by pressing a "leveling button" on the stick.

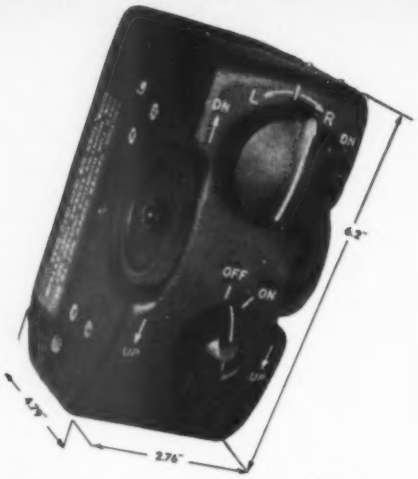
• **Controlling speed to a given Mach number** is accomplished by corrections made in pitch attitude after a "Mach hold" button is pushed.

• **Altitude control** can hold the plane within a few feet of existing barometric altitude.

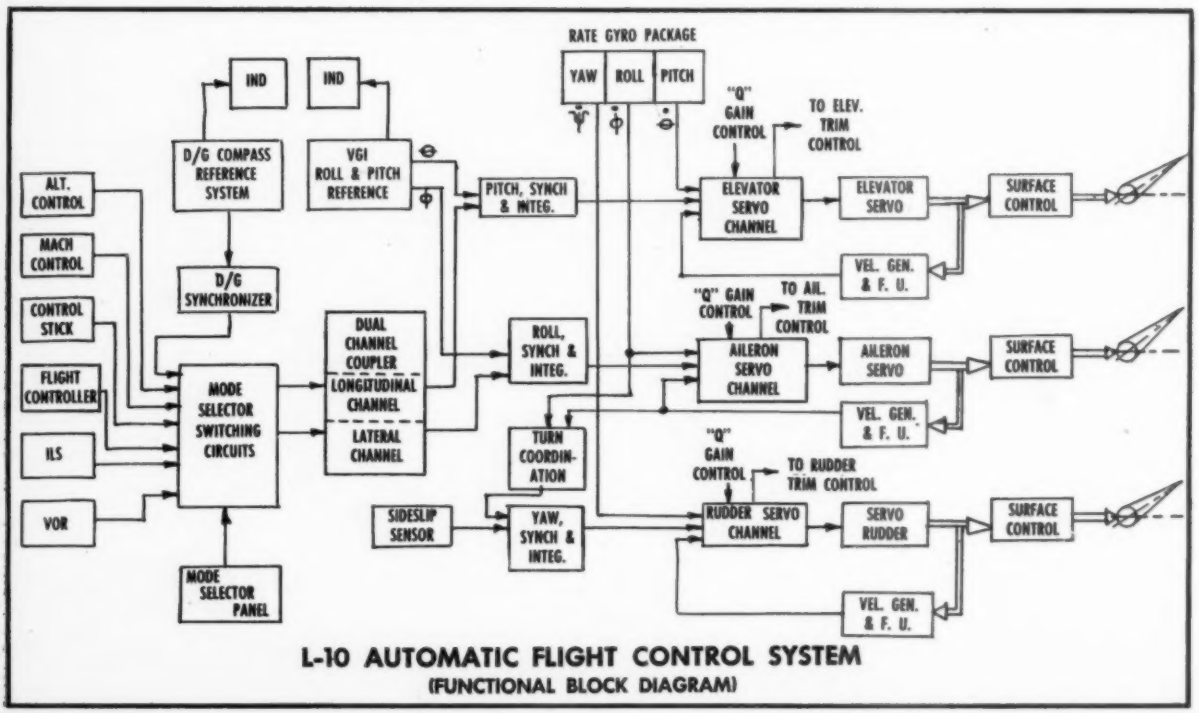
• **Guidance signals** from ground navigation or airborne fire control or bombing systems can be used to operate the L-10, as a result of the high precision achieved with the tight control surface positioning.

• **Lighter weight:** Feature-for-feature, the L-10 has shaved about 10% off the weight of comparable F-5 component. Lightweight, compact design of new features not found in the F-5 has kept total weight down to that of the earlier system.

Preliminary engineering proposals, outlining the L-10's features, have been submitted to manufacturers of such



Dimensions show compactness of new autopilot's console.



L-10 AUTOMATIC FLIGHT CONTROL SYSTEM
(FUNCTIONAL BLOCK DIAGRAM)

new *SAFE FLIGHT* SPEED CONTROL SYSTEM zeros you in at perfectly controlled minimum speeds!

SAFE FLIGHT
Speed Control Indicator
Plane is being operated at proper speed when pointer is centered. Fail safe flag alarm guards against any malfunctioning.

Now—continuous direct information about wing lift at a glance! The revolutionary Safe Flight Speed Control System eliminates last minute calculations of gross weight, acceleration, configuration, turbulence, etc. . . . automatically displays the best lift coefficient at critical take-off and approach speeds. Fewer high-speed landings with excessive wear on brakes and tires. No excessive reverse pitching and overshoots!

Constant checking of the airspeed indicator is unnecessary: when the pointer of the Speed Control Indicator is on the triangle, speed and attitude are correct . . . initial climb is best under existing power and weight conditions. The Speed Control System's instantaneous non-lagging operation is particularly important in the event of engine failure in multi-engine aircraft after take-off.

Speed Control System components, including the Safe Flight Lift Transducer and Lift Computer—are rugged in design, unusually free of maintenance. Wing transducer coils are completely sealed. Flag alarm provides fail-safe indication. Speed Control System meets all pertinent Air Force, Navy and Civilian specifications.

Write for detailed information.

SAFE FLIGHT *INSTRUMENT CORPORATION*

"Pioneers in Lift Instrumentation"

WHITE PLAINS, NEW YORK

widely divergent types as a turboprop transport and a jet fighter, illustrating Lear's contention that the L-10 is "a collection of building blocks which can be tied together readily in an infinite variety of combinations . . . to meet any of the widely varying requirements of different types of aircraft."

The damper function provided in the L-10 is one of the features which Lear expects to win wide acceptance. "The production design of all previous autopilots," says the manufacturer, "did not provide damper functions on all axes in all attitudes at once. In those attitudes at which vertical gyro references become unreliable or invalid, the autopilot cannot function. The L-10, as an inherent design concept, provides all attitude damper functions on three axes. The result is all-attitude maneuverability, which is necessary for inherent adaptability to fire-control and bombing system tie-ins."

Component Summary

The Lear L-10 Automatic Flight Control System is comprised of the following components:

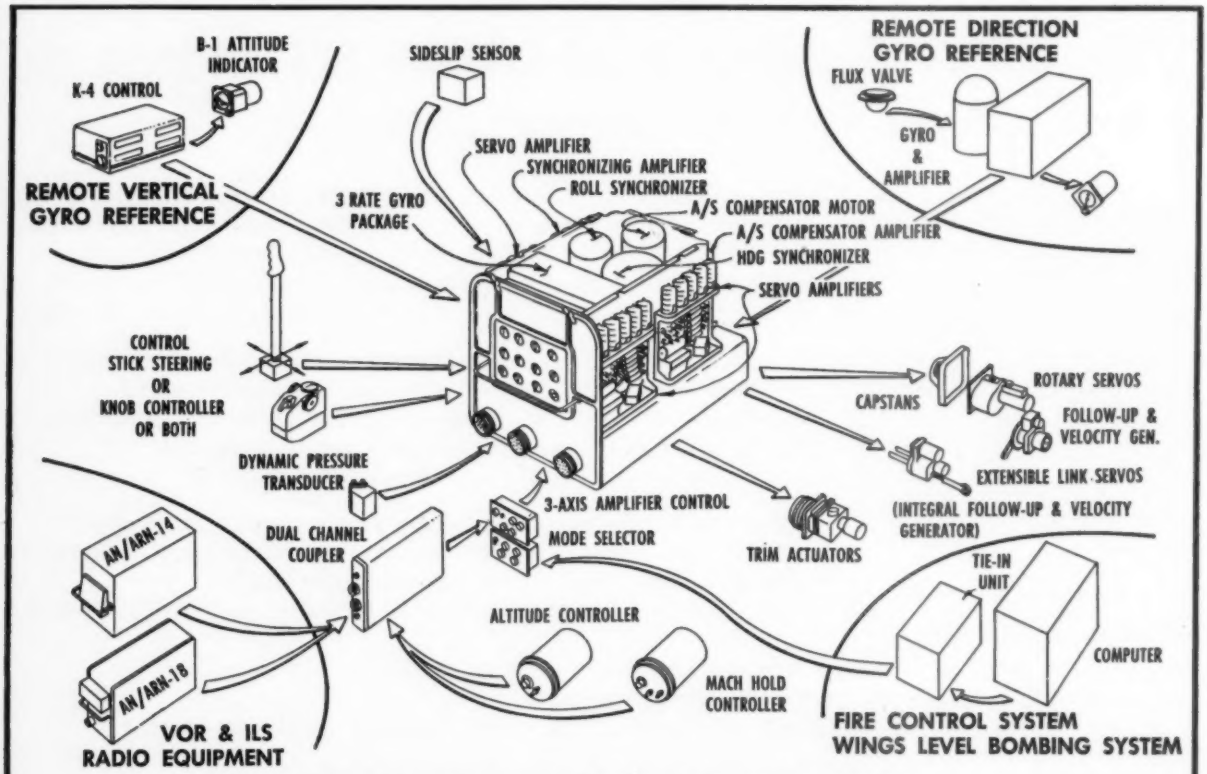
Item	No. Req'd	Description	Size (in.)	Lbs. Per Unit	Power Required AC	Power Required DC
1	2*	Rotary Servo Drive	4.75 x 3.4 x 6.75	5.1	—	130
2	1*	Extensible Link Servo ...	4.25 x 4.75 x 11.75	5.5	—	65
3	2	Servo Drum and Bracket	5.2 x 5.0 x 2.3	1.2	—	—
4	2	Vel. Gen. and Follow-Up .	3.0 x 3.74 x 2.25	1.1	29.1	—
5	1	Main Amplifier Chassis ..	9.8 x 15.3 x 10.3	26.7	92.0	82.5
6	1	Lateral Accelerometer or Law Vane	2.75 x 2.5 x 3.25	1.9		
7	1	Altitude Controller	9 x 5.5 x 5.25	1.5	Note A	2.0
8	1	Mach Hold Controller	5.5 Dia. x 6.0	2.5	Note A	2.0
9	1	Dual Channel Coupler ..	13.8 x 2.0 x 7.88	7.9	4.5	18
10	1	Flight Controller	6.2 x 2.76 x 4.79	2.9	Note B	5.0
11	1	Dynamic Pressure Transducer	2.91 x 2.13 x 2.86	0.5	Note B	—
		Total	**(Lbs.)**	**62.2**	**125.6VA**	**304.5W**

Note A—AC power for items 7 and 8 is included in item 9.
Note B—AC power for items 10 and 11 is included in item 5.
* The exact choice and arrangement of rotary and extension link servos will depend on the airplane application.

Pitch stabilization is achieved in response to signals from the pitch pickoff of the remote vertical gyro. Damping is provided by a rate gyro. Servo rate feed-back provides high accuracy in control surface positioning. When the autopilot is disengaged, the pitch control channel automatically synchronizes with the motions of the airframe, so that when the autopilot is again turned on there is immediate stabilization. Compensation provides the required up-elevator during turns, to offset loss of lift due to bank angle.

Roll stabilization is provided by servo actuation of the ailerons, in response to signals from the roll pickoff of the remote vertical gyro. As in the pitch channel, damping is provided by a rate gyro, and minor loop damping by servo rate feedback. The channel is continuously synchronized with the motion of the aircraft. If the autopilot is engaged while the plane is in a roll, it can automatically be held in this position until the "level" button is pushed, or can be set to return the plane to wings-level attitude.

Yaw stabilization comes from the action of a rate gyro oriented in yaw feeding signals to the rudder loop, not



LEAR L-10 AUTOMATIC FLIGHT CONTROL SYSTEM

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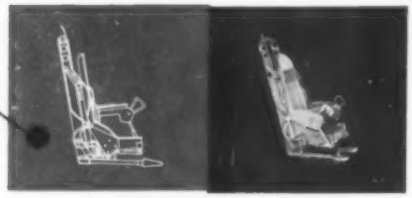
you can rely on Weber for dependable aircraft equipment. This has been proven by the many products in service today for the Armed Forces and commercial airlines. Requirements for all types of fixed and ejection seating are being fulfilled in new aircraft. Call on Weber Engineers for help on your aircraft equipment problem. You can depend upon their solution.



WEBER AIRCRAFT CORPORATION

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Circle No. 16 on Reader Service Card.

Flexonics Ducting Components absorb thermal expansion at 1400° F. in the Douglas C-124 heating system

Photo Courtesy Douglas Aircraft Company, Inc., Long Beach Div.

CHECK FLEXONICS FOR ANY OF THESE COMPONENTS, TOO—

FLEXON DUCTING is available in thin wall and heavy wall types in a complete range of sizes with or without insulation. Elbow forming and rib reinforced types can also be supplied.

FLEXON METAL HOSE is manufactured in the broadest variety of sizes and types for all aircraft applications.

FLEXON BELLOWS are made in an almost unlimited range of sizes and types to meet the most advanced requirements.

Thermal expansion, at 1400° F., accompanied by vibratory motion created a design problem in the exhaust line of the main cabin heater of the Douglas C-124. A connection was necessary that would absorb expansion and vibration at very high temperature and seal exhaust gases at 30 psi. The problem was solved with a 6" I.D. FLEXON Rex-Flex Type RF-40 assembly designed for .4375" compression and equipped with a stainless steel liner. Rex-Flex Type RF-40 is an annularly corrugated, stainless steel flexible section particularly suitable for high temperature expansion control.

Whenever connections must be made to absorb expansion and vibration, specify FLEXONICS Ducting Components. There is a size and type for every need. For specific recommendations, just send an outline of your requirements.

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Flexon identifies products of Flexonics Corporation that have served industry for over 53 years.

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from the heading reference of the directional gyro. A slide-slip detector provides signals to insure coordinated flight under all conditions. An aileron position signal is also fed into the rudder channel to provide for coordination at entry into a turn.

Automatic trim control, operating through the trim tab actuators, is used with the L-10 so that when the autopilot is disengaged the aircraft will be in trim.

Heading control of the L-10 responds to command directions from the pilot by disengaging the remote directional gyro whenever the turn knob on the controller is displaced from center detent, or when the pilot rolls into a turn by means of the stick. When the turn knob is returned to center, or when the pilot levels the plane by using the stick, the remote directional gyro is once again engaged at the new zero point.

When omnirange navigation or automatic approach control is in use, the plane moves along a path indicated by VOR error signals or the ILS needle. Localizer beam information is fed into the roll control system as bank angle commands, holding the aircraft on the beam despite cross winds or other disturbances. When the plane intercepts the glide path beam, pitch angle control is applied automatically.

Lear's concept of the L-10 as a set of infinitely adaptable "building blocks" foreshadows an unspecified number of improved models, with occasional changes of designation to remind customers of the progress being made. Some of the improvements already in the breadboard or flight test stage involve tubeless designs, with both transistor and magnetic amplifier types now under development. • • •

Future of Marquardt Ramjet Looks Good

Prospects for extended use of Marquardt Aircraft Co's supersonic ramjet engine were forecast recently by President Roy Marquardt in a year-end message to employees "We have a ramjet engine that looks good—so good that we have a second customer for the same engine," he commented.

Marquardt said that past troubles have been overcome and that the company has gone on with the engine to set new records for speed, altitude, endurance, and range for air-breathing engines in the supersonic class. Deliveries to the company's principal customer, presumably meaning Boeing Airplane Co. for the Bomarc missile, were reported to have been resumed.

TO THE VICTOR...

MACKAY TROPHY
1951–1954

HARMON TROPHY
1951

GUNNERY TROPHY
1954

ALLISON TROPHY
1951–1953

BENDIX TROPHY
1949

1954
U.S.A.F.
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Republic's ***THUNDERJET !*** *In peace as in war, the skill and training of American airmen have won for the F-84 the "title" of* ***The World's Most Honored Airplane.*** *Famed as the mighty U.S. Air Force workhorse of the Korean War . . . actively serving NATO and our other allies . . . Our sincere congratulations to the USAF officers and airmen who flew or serviced the missions which gained for them these and many other awards.*

CEILING UNLIMITED *for the young ambitious man . . . new vistas of education, travel and security . . . all these are available to career airmen in the U.S.A.F. Every day you're in brings you greater satisfaction in the knowledge that yours is a vital and rewarding service to your country . . . to yourself.*

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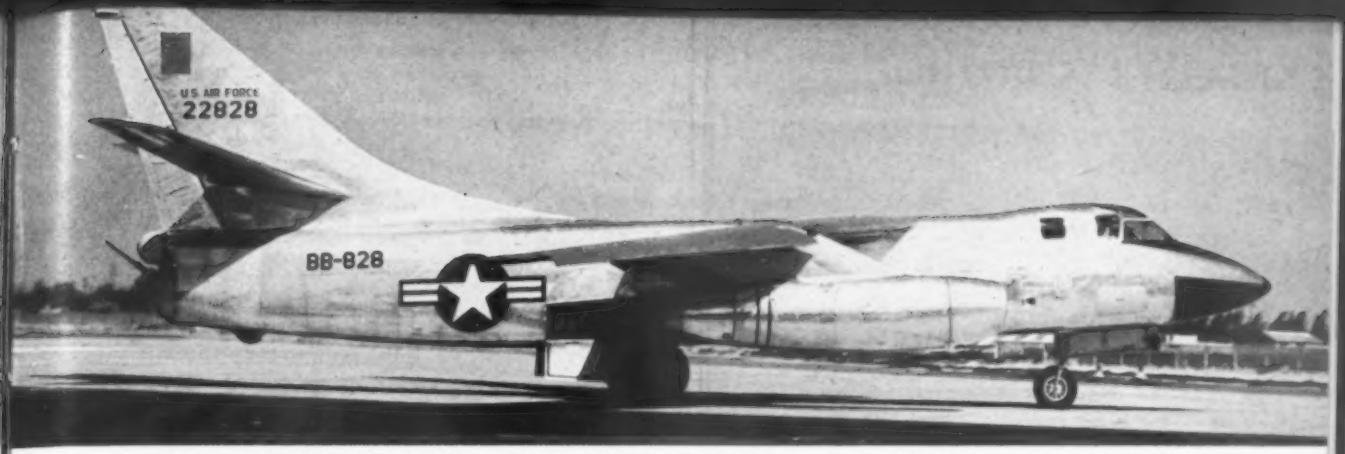
Designers and Builders of the Incomparable **THUNDER-CRAFT**

Douglas B-66 takes off at Long Beach, California, for its test run. Its electrical system was designed by G-E application engineers to deliver rated load with 80° C cooling air.

GENERAL ELECTRIC



Side view of bomber shows sleek lines. It is first production aircraft to have an elevated ambient temperature a-c electric system.

Latest Air Force bomber has new G-E engineered power-generating electric system

NEW GENERAL ELECTRIC ENGINEERED SYSTEM MEETS DOUGLAS B-66 OPERATIONAL DEMANDS FOR HIGHER AMBIENT TEMPERATURES

A new a-c electric power-generating system has been developed by General Electric, and is now operating on the Air Force's newest light bomber, the Douglas B-66. The system consists of three major components: high-efficiency alternators, static voltage regulators, and generator control and protective panels.

DESIGNED FOR HIGH PERFORMANCE AIRCRAFT

With a generator that can operate at high ram-air temperatures of high speed flight, the new G-E system is designed for long life and reduced maintenance time. Its static voltage regulator has no moving components to wear out, and under laboratory testing it has withstood 5000 hours of operation without maintenance.

Regulation is preset, and requires no pilot adjustment of voltage or load division. The control panel supplies the automatic control of start-up, shut down, and maximum protection against ground fault, over and under excitation, and open phase.

SPEEDS TAKE-OFF, SPARES PILOT

The new equipment begins operating as soon as the pilot starts the engine. The system contains only two toggle switches, which may remain "on" at all times, even when a fault develops. This eliminates a series of pilot functions and sharply reduces the time required to become airborne. Under normal conditions, fault clearing and resetting are fully automatic.

SINGLE SOURCE FOR COMPLETE SYSTEMS

General Electric offers a single source for complete a-c or d-c power generating systems and constant speed drives for most aircraft. For more information, contact your nearest G-E aviation specialist, or write Section 210-92, General Electric Company, Schenectady 5, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Static regulator (left) maintains constant alternator output voltage. Control and protective panel (right) helps locate and isolate faulty generation.

New G-E high-efficiency a-c generator has no harmonic over 1%; produces full rating when exposed to high temperatures in high speed aircraft.

Tests of system showed better protection against over voltage, over and under excitation, ground fault, anti-cycling, difference current, and open phase.

QUALITY CONTROL

• HOW NORTHROP MAKES IT WORK

THE EFFORT to improve the quality but cut down on the quantity of the paperwork that threatens to overwhelm modern industry has received new impetus from Northrop Aircraft, where a new system of quality control record keeping has been hailed as fast acting, comprehensive, and economical.

Determined that quality control must be more than an inspector pulling rejects off the assembly line, Northrop took a new look at the records it was keeping and how they were being handled. The result has been described by Robert S. Catlin, director of quality control. The system is built around four basic forms which are used in handling all types of squawks and fixes:

• *Subassembly replaced:* When the subassembly is taken out of the airplane following a flight test squawk, it is replaced by another, and the fix is accomplished sometime later.

• *In-the-aircraft fix:* When a minor component is replaced on the spot, while the subassembly remains in the plane.

• *Watchdog record for individual components:* With complex systems like radar, where records must be kept of history of individual components.

• *"Barometer" signaling trouble spots:* Summary sheet of all squawks warns management which subsystems are causing most difficulty.

Northrop's quality control program is built around two tenets:

• What matters in the end is how the systems behave when installed together in the airplane, rather than how they perform when isolated on the bench.

• Quality control serves the corporation best by functioning as an indicator of how well engineering, manufacturing, and the other divisions of the company are accomplishing their objective of turning out a quality product.

The first of these beliefs led to the choice of flight test irregularities (including preparation and post-flight) as the criteria for the new record-keeping system. The second led to the development of forms designed for quick reproduction and circulation among members of top management.

The need for flexibility in record-keeping, in order to avoid swamping the whole program with a flood of information or starving it with too little detail, led to the use of the "barometer." When squawks on any system become too numerous, all relevant information is poured into a special study group, which attacks the problem. Until that danger point is reached, minimum data are taken and circulated.

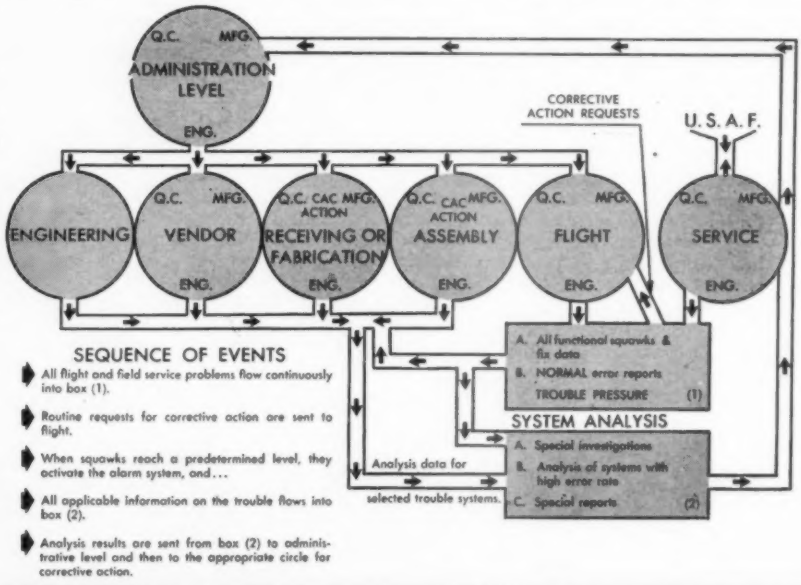
First step in setting up the program was to break the airplane down into major systems. These were then further broken down into subsystems, so that the exact areas of trouble could be pinpointed with a fair amount of precision. The systems include:

Landing gear, navigation, electronics, cockpit furnishings, hydraulics, engines, fuel system, structures, flight control system, and general. As an example of how these divide into subsystems, the navigation system includes (ADF) radio compass; marker beacon; (VOR) omni or localizer; glide slope; (J-2) compass, remote; flight computer; and (magnetic) compass, standby.

Basic problem was to find a means of keeping track of squawks which did not result in rejects, which were already adequately reported.

Here is how the program works in detail:

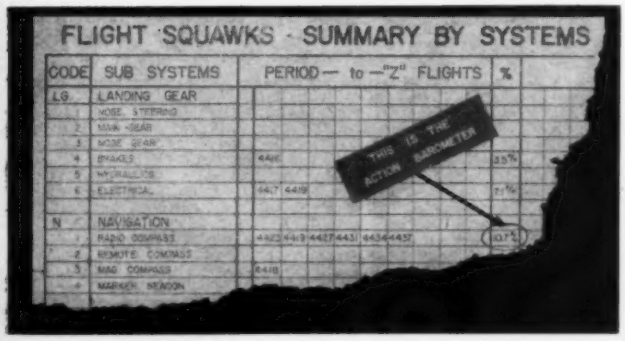
Subassembly replaced: The first type of summary form illustrates action taken on subassemblies which are removed from the aircraft for later fixing. Date, aircraft number, and flight test or prep-for-flight-test number are recorded.

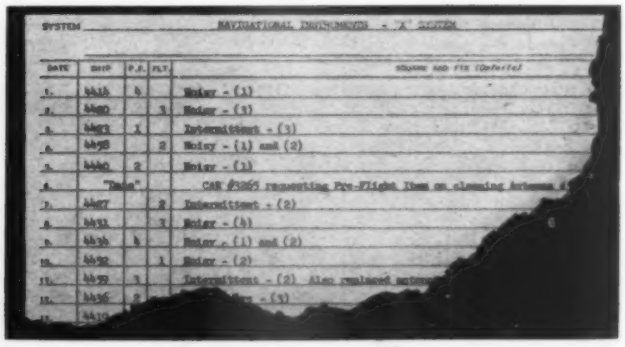


SEQUENCE OF EVENTS

- All flight and field service problems flow continuously into box (1).
- Routine requests for corrective action are sent to flight.
- When squawks reach a predetermined level, they activate the alarm system, and...
- All applicable information on the trouble flows into box (2).
- Analysis results are sent from box (2) to administrative level and then to the appropriate circle for corrective action.

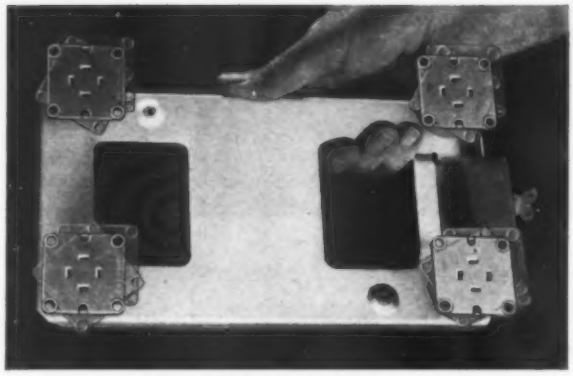
FLOW CHART shows how information is funneled into anaylsis group from all parts of company after number of squawks on a subsystem reach danger point. Below, the "barometer" which warns of trouble piling up. Below right, form used for reporting "in-the-aircraft" fixes.





PLAIN FACTS ABOUT VIBRATION AND SHOCK MOUNTINGS

FOR AIRBORNE ELECTRONIC EQUIPMENT

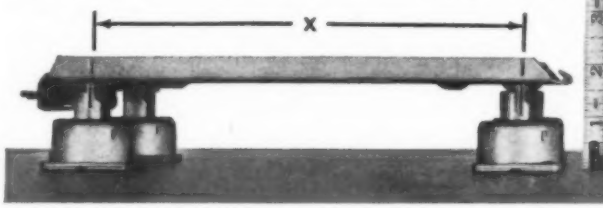


OUT-DATED UNIT MOUNT BASE

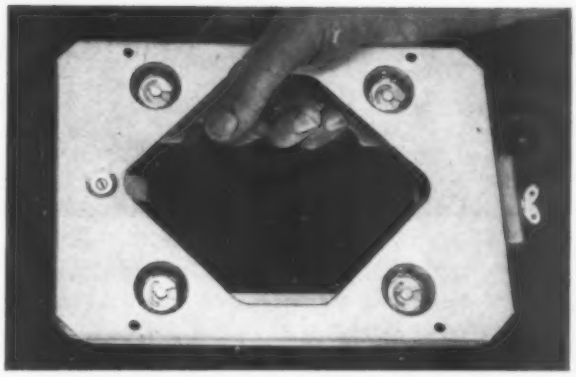
16 mounting holes and 16 bolts required.

Unit mountings may be improperly attached to the rack, and are very likely to be seriously misaligned during attachment to aircraft or missile structure.

Even minor discrepancies in spacing and attachment of unit mounts can defeat the whole purpose of the mounting base, and result in poor performance and deterioration of equipment.



Excessive height required. Unit mount bulk imposes reduced spacing (X) between support centers, resulting in impaired stability (critical in lateral direction). Greater sway space required.

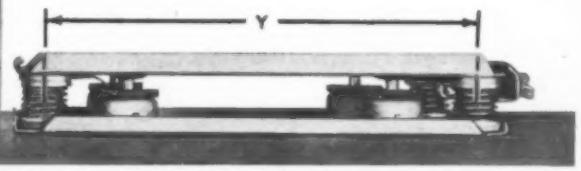


TODAY'S ENGINEERED MOUNTING SYSTEM

Only 4 mounting holes required.

Prespaced holes in a one piece base plate assure quick, accurate attachment. Relationship of all 4 holes is definitely fixed (holes spaced for interchangeability with unit mounts).

No installation errors or misalignment can occur to disturb the precise performance of the mounting system as checked and approved on acceptance tests.



Note reduction in mounting height. Important space saved. Maximum spacing (Y) of resilient elements at extreme corners provides stability. Less sway space required.

Well Designed Electronic Equipment, *If Poorly Mounted,* Too Often Operates Inefficiently and Unreliably

Failure also can result from use of inadequate mountings which are not engineered for the particular equipment and purpose. Conventional shock mounts or so called "isolators", reasonably effective when installed under ideal laboratory conditions, become dangerous trouble makers when installed by usual production line methods.

Attachment of a base plate to unit mounts to achieve spacing control is a makeshift arrangement resulting in excessive weight with no height reduction.

Failure also can result from obsolescent unit mounts employing internal rubber, organic or synthetic materials which deteriorate rapidly and are susceptible to temperature and environmental changes.

The importance of today's electronic equipment surely justifies the use of integrated mounting systems designed to meet specific problems rather than the unreliable application of assembled "catalogue" mounts.

Robinson All-Metal Engineered Mounting Systems Assure Outstanding Performance and Reliability of Equipment

The Robinson concept of vibration and shock control is the design and application of 100% all-metal mounting systems. Engineered with careful understanding of the equipment to be protected and performance expected, Robinson mounting systems come to you completely manufactured, ready to receive the electronic equipment or instrument.

The integration of these mounting systems into the electronic equipment of aircraft and missiles results in reduction of elapsed design time and basic development cost.

Robinson Mountings utilize, as main resilient elements, metal wire cushions (MET-L-FLEX), exclusive with Robinson. This construction has been thoroughly proven by years of use in nearly all military and commercial aircraft.

Some other important characteristics of Robinson Mountings: inherent high damping, non-linear spring rate, performance unaffected by grease, oil, water, dust, extreme temperatures or environmental changes.

USE OF ROBINSON ENGINEERED MOUNTING SYSTEMS results in:

A. Reliable and uniform performance in every installation under all types of environmental conditions.

B. Reduced cost through "de"ruggedization of equipment – substantial reduction of size and weight is possible by simplified and compact design.

C. Simplified installation – only four attachment holes required–pre-spaced to save time and assure accuracy.

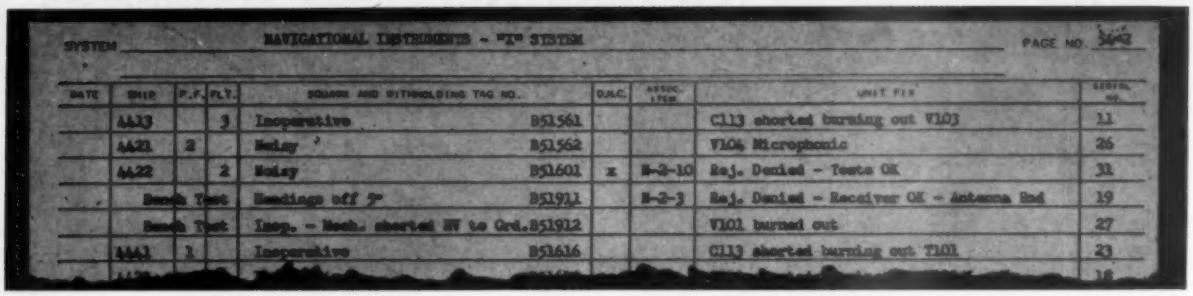
For full information about this new concept *of vibration and shock control, write or wire today.*

ROBINSON AVIATION INC.

TETERBORO, NEW JERSEY

Vibration Control Engineers

West Coast Engineering Office:
3006 Wilshire Boulevard, Santa Monica, California



SYSTEM NAVIGATIONAL INSTRUMENTS - "Z" SYSTEM PAGE NO 34-2

DATE	SHIP	P.F.	FLT.	SQUAWK AND WITHHOLDING TAG NO.		D.N.C.	ASSOC. ITEM	UNIT FIX	SERIAL NO.
	4413		3	Inoperative	B51561			C113 shorted burning out V103	11
	4421	2		Noisy	B51562			V106 Microphonic	26
	4422		2	Noisy	B51601	x	5-2-10	Rej. Denied - Tests OK	31
	Bench Test			Heatings off "Z"	B51911		5-2-3	Rej. Denied - Receiver OK - Antenna Bad	19
	Bench Test			Insp. - Mech. shorted HV to Grd.	B51912			V101 burned out	27
	4441	1		Inoperative	B51616			C113 shorted burning out T101	23
									16

SUBSYSTEM REPLACED: Form used when unit is pulled from aircraft for fix.

A brief description of the squawk is included, plus the number of the rejection tag which will identify the removed unit. Rework other than replacement is shown under a column headed "Associated Failures." In this column the code number is shown for the sheet on which the fix is described.

The removed subassembly goes to the repair area, where technicians overhaul it and write their findings on the rejection tag. A copy of this tag goes to a statistical analyst, who then makes the fix entries on the right-hand side of the form. If the trouble continues despite the removal of the subassembly, an "X" is placed in the column headed "DNC" (Did Not Cure).

As the statistical analyst fills in the right-hand side of the form, noting the effective and ineffective fixes, he is able to discover the patterns in which trouble is appearing. If the "barometer" reaches the alarm point on a unit he calls for additional data.

Receiving test (if the unit comes from a vendor) and bench test reports have previously been recorded and filed. Now they are quickly available. When the situation is clear, the analyst puts in a request for corrective action, similar to those common in many companies. Valuable hours are saved at this stage because the appropriate forms are rapidly reproducible, and are consequently included with the request for action. No time is lost searching for pertinent details: they are all in the same package.

One point that Northrop insists on is the importance of including the cause of the failure, if it is known. A burned-out transformer, for example, may indicate a weakness in a system, or it may merely indicate that a mechanic accidentally shorted the wrong end of a filter choke. By the same token, if three units fail, the latter two as a result of the first, valuable time and effort will be wasted if this fact is not included when the squawk is reported.

In-the-aircraft-fix: This form is similar to the preceding one. Date, aircraft number, flight number, squawk, and fix are entered. To keep writing to a minimum, a variety of fixes are listed at the bottom of the sheet, and only the code numbers are used. On the form shown, the following code is used: (1) cleaned, (2) realigned, (3) replaced, (4) repaired, all referring to antenna canopy disconnects.

Watchdog record: This form is used very rarely. Only one or two subassemblies need to have their components handled with such close attention.

"Barometer" summary: All subsystems and the squawks against them are listed here in simplified form. The trouble being encountered with each subsystem is expressed by the ratio of squawks to flights. This summary is distributed to top management.

In particular trouble areas a summary of squawks is also prepared as a matter of routine, going into the mail to interested groups early each week. Information is entered daily, and since the report form is a reproducible master, copies can be run off quickly at any time, if up-to-date information is needed.

If the problems of a particular system warrant specialized attention, a quality control analyst is assigned to conduct a full-scale investigation. In one case, following such a broad investigation of the design specification, checkout procedures, and test equipment, the flight failure rate of a subsystem was cut 50% within 60 days after the investigation was begun.

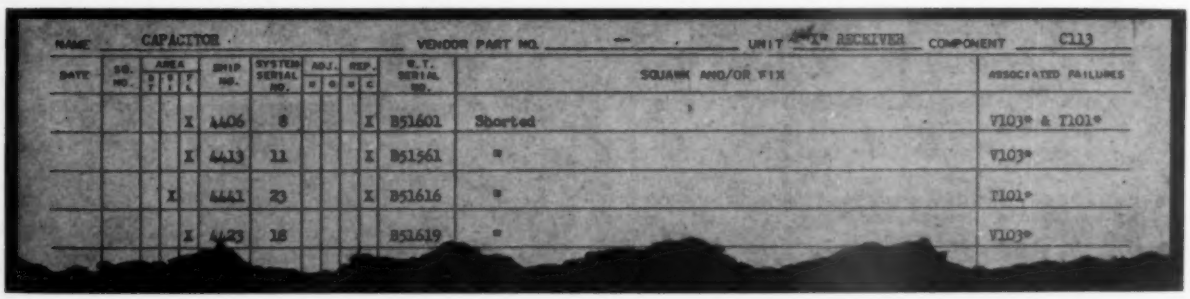
Despite such signs of success, Northrup is not resting on its laurels. "The ideal systems analysis procedure would be capable of anticipating trouble even before the system actually came into being," said Catlin recently. "With this goal in mind we will continue to refine the system."

NEW REPRESENTATIVE FOR AAP IN ENGLAND

To assist in the promotion of the expanding business of AMERICAN AVIATION Publications in the United Kingdom an associated independent company has been formed to handle AAP interests there. AAP's sole representative for subscription orders and advertising is now: The AAP Co., 17 Drayton Road, Boreham Wood, Herts.

All U.K. inquiries should be addressed to this company. Foreign payments can be made directly to it in sterling.

WATCHDOG ON COMPONENTS: Form used when history must be kept on each component in complex system like radar.



NAME CAPACITOR VENDOR PART NO. — UNIT "Z" RECEIVER COMPONENT C113

DATE	SQ. NO.	AREA D	AREA T	AREA F	SHIP NO.	SYSTEM SERIAL NO.	ADJ. R	ADJ. C	REP. R	REP. C	U.T. SERIAL NO.	SQUAWK AND/OR FIX	ASSOCIATED FAILURES
				X	4406	8			X		B51601	Shorted	V103* & T101*
				X	4413	11			X		B51561	"	V103*
			X		4441	23			X		B51616	"	T101*
				X	4423	16					B51619	"	V103*

THE PROOF IS IN THE PACKAGES!

Rohr has won fame for becoming the world's largest producer of ready-to-install power packages for airplanes – like the Lockheed Constellation, Douglas DC-7, the all-jet Boeing B-52 and other great military and commercial planes.

This, we believe, is proof of Rohr's engineering skill and production know-how. But it's not the whole story.

Currently, Rohr Aircraftsmen are producing over 25,000 different parts for aircraft of all kinds... many of these calling for highly specialized skill and specially engineered equipment.

Whenever you want aircraft parts better, faster, cheaper – call on Rohr. The proof of engineering skill and production know-how is in the thousands upon thousands of power packages that have made Rohr famous.

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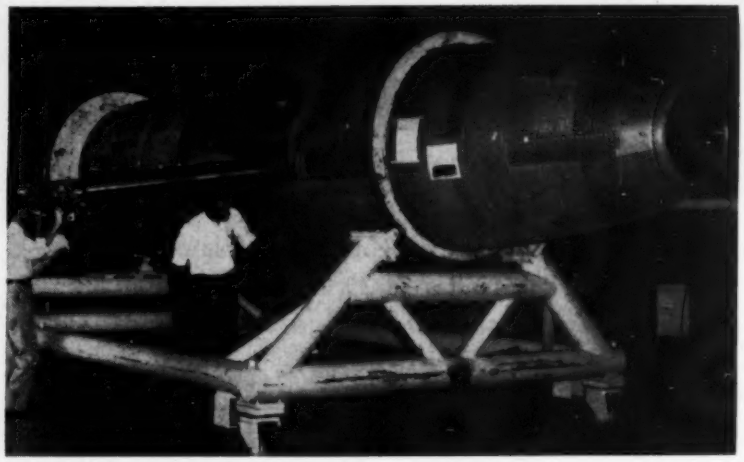
CHULA VISTA AND RIVERSIDE CALIFORNIA

Maintenance Bulletin Board



Tiny Drill Motor Powers Regulus "Roll-Over" Jig

A small drill motor is the only power required to operate a new "roll-over" jig designed by Chance Vought Aircraft, Inc. to remove manufacturing scrap metal from its Regulus missile before engine installation.

Two special rotation rings are mounted on the nose and tail of the Regulus and the complete missile is turned slowly over on the jig several times to remove scraps from inaccessible areas. CVA is now developing a vibrating device for installation inside the fuselage shell to further help dislodge the foreign material.

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Circle No. 18 on Reader Service Card.

String in Place of Cement Saves Money for TWA

Trans World Airlines has found a solution to high parts replacement costs experienced in maintaining Hamilton Standard propeller control switch assemblies. The problem centered around upkeep of the protective boot which had to be cemented in place on the switch plunger. It not only required excessive drying time at overhaul, but was so difficult to clean up for replacement that the usual result was scrappage (see bottom of photo).

The answer, TWA learned through its employee suggestion plan, was simple. The plunger was reworked by machining a larger groove and by standardizing on another boot used by Hamilton Standard on its model 83761 switch. Now the boot is placed over the end of the plunger inside-out, tied with a string at the groove location, then pulled back to its normal position to protect the plunger (top of photo).

As a result the plungers now have an indefinite life and another TWA high-scrappage item has disappeared from its books.

Temco Device Saves On Circular Cutouts

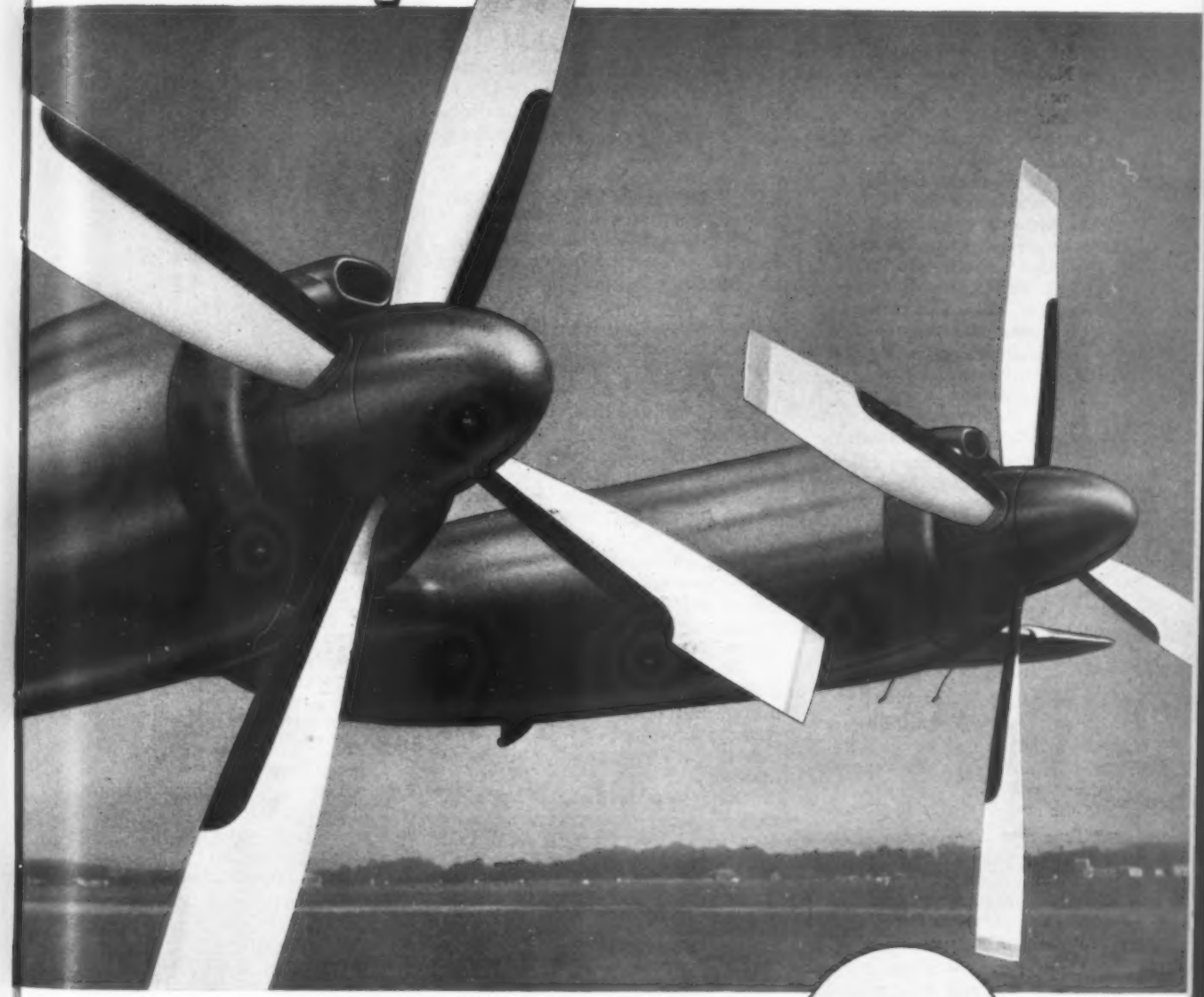
Quick disposal of slugs cut by hole saws is accomplished at Temco Aircraft Corp. by adoption of an employee suggestion that saves the saw operator two to three minutes per hole. It calls for a steel spring attached to the saw pilot to automatically eject the slug as the hole is cut through.

Idea for the ejector was developed by F. P. Rose, Jr., a Temco plastics frabicator. It is now in production use to make circular cutouts in Fiberglas aircraft battery boxes.

Northrop Cuts Run-Up Time With Electrical Check

Northrop Aircraft, Inc. has reduced engine run-up time on its F-89D Scorpions by 75% by use of a newly developed "black box" for testing electrical inputs to the two engines before they are installed in the airplane. It is hooked to the cockpit of the airplane while in final assembly and a simulated load is imposed on the electronic engine controls and engine harness.

Capital Airlines



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TINKERTOY IS TAKING HOLD

BY JOSEPH S. MURPHY

MORE than a year has passed since the Navy Bureau of Aeronautics and National Bureau of Standards first unveiled their Project Tinkertoy scheme of automatic electronics production. Today prospects look brighter than ever that it is beginning to take hold.

Navy experience in evaluating Tinkertoy-produced components shows them to be generally superior to manually assembled units, so much so that BuAer is on the verge of insisting on some form of automatic output for future high quantity production items. Added to this, industry trends point to wider acceptance of automation (one large firm is about to unveil a multi-million-dollar facility purely for production of Tinkertoy components).

Project Tinkertoy, now officially known as the MDE-MPE (Modular Design of Electronics-Mechanized Production of Electronics) system, produces finished electronic stages or modules from raw and semi-processed materials. Capacitors, resistors, and tube sockets are combined on ceramic base wafers by printed circuit and dip-soldering techniques, dispensing entirely with individual hand-soldering of components as in conventional equipment.

Now to further enhance the potential of Tinkertoy acceptance, the Bureau of Standards has announced new developments and techniques which fit into the overall Tinkertoy scheme:

• **Tape capacitor**—An entirely new item gives the process a better performing capacitor. Although it falls short of silver-mica capacitor performance, the new NBS unit compares favorably with run-of-the-mill mica types.

• **Chip Resistor**—Solves a basic shortcoming of the Tinkertoy system for the electronics engineer in development work. Now resistors of varying values can be kept on hand and simply inserted into a circuit by soldering.

• **Carbon Resistor**—Gives Tinkertoy a true precision resistor. Experience shows that sometimes 10% of the resistors used in a piece of military electronics equipment must be of the precision variety (accurate within ±10%) but original Tinkertoy tape resistors fell short of these standards. Using a process developed by Bell Telephone Laboratories in making pyrolytic carbon resistors, NBS has already manufactured resistors for small production runs.

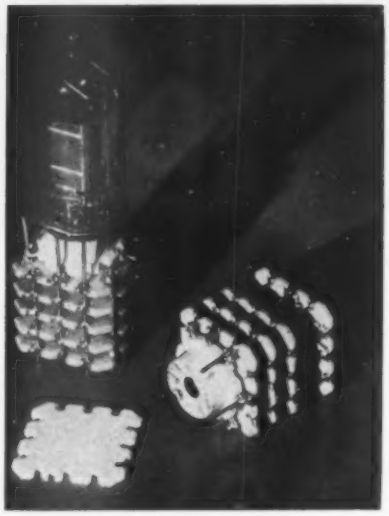
The new adhesive tape capacitor is produced in much the same manner as the earlier tape resistor unveiled when the automatic process was first announced (AMERICAN AVIATION, Oct. 26, 1953). A conducting tape coated on one side with a dielectric serves as one element of the capacitor and the silver pattern printed and fired on the wafer, the other.

Materials used in their manufacture are a heat-resistant asbestos paper tape, silver flake, silicone resin, butyl cellosolve, a powdered high-K titanate body, N-hexane and epoxy resin. A mixture of flake, silicone resin and solvent is ground in a ball mill, sprayed on one side of a 1¼" wide tape, allowed to dry thoroughly, then sprayed on the other side.

Once cured the tape is conductive along each side and from one side to the other. It is then split down the center to form two ⅜" wide tapes with each 19 ft. of tape producing about 350 capacitors.

Next step is the application of dielectric film composed of the titanate body that is pulverized in a ball mill with N-hexane until the particle size is about one to two microns. After the slurry is allowed to evaporate, the titanate is mixed with epoxide resin and further ball-milled. Final step is the spraying of the mixture on the tape in various thicknesses with the thicker applications producing the lower value capacitors.

NBS shelf life tests show that capacitance of these units changes no more than 1% in the first month, with no change in dissipation factor which averages 0.7% at 1 kc.



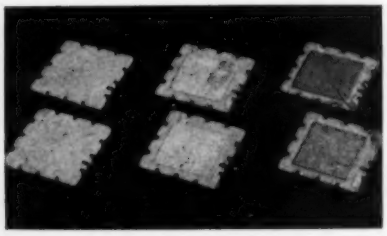
Finished module combines printed circuits, tape resistors, capacitors, and tube socket.

Although the new chip resistor is not intended for use in regular production of Tinkertoy modules, its role in assisting the electronics design engineer in development work has prompted NBS to develop machinery for its production.

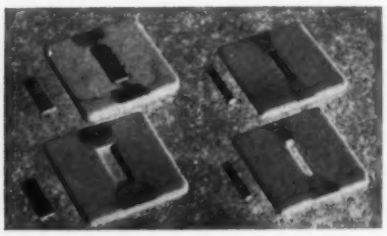
Adaptation of the new pyrolytic carbon resistor to the Tinkertoy process called for specially designed wafers that are grooved to accommodate either flat or cylindrical resistors measuring ⅜" long by ⅛" wide or 1/16" in diameter.

The resistor is produced by cracking or decomposing methane gas in a high temperature environment which contains the small ceramic forms. Pure carbon is then deposited on the ceramic in accurately controlled thicknesses, followed by a spiraling or grooving operation to increase the electrical path length and decrease the path cross-section.

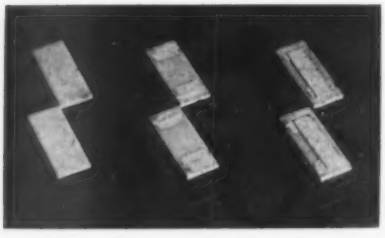
According to NBS, it has been possible to accurately control resistance to the point where finished resistors are within 2% of their design value. Final assembly of the resistor to the newly designed wafer involves termination with a silver thermo-setting compound and curing first at 150°C for two hours then at 200°C for one-half hour.



Tape capacitors in varying stages of production.



Pyrolytic carbon resistor can be round or flat.



Chip resistors aid electronics engineer in study of new modular circuits.

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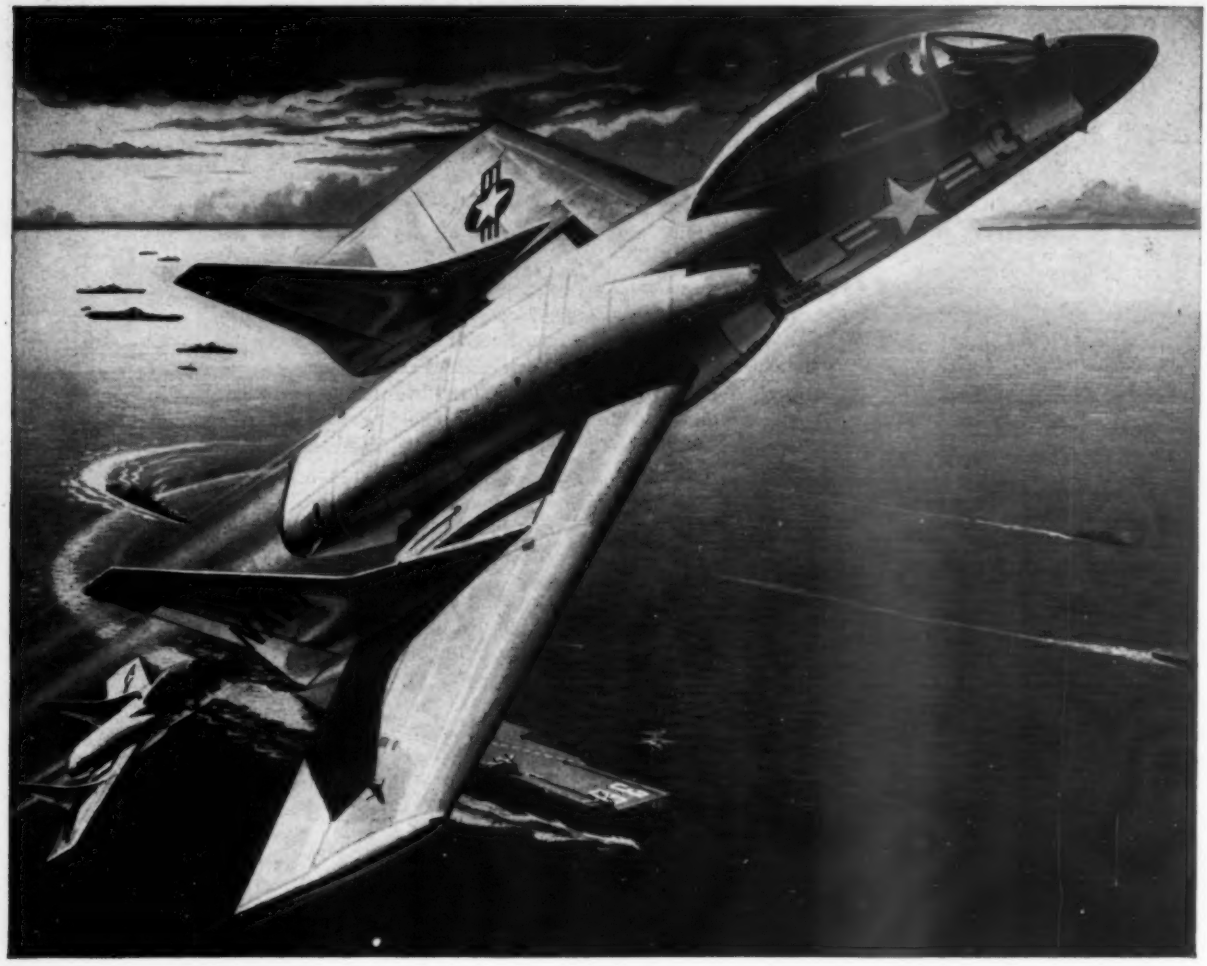

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Circle No. 20 on Reader Service Card.

West Coast Talk . . . By Fred S. Hunter

- **How super-doopers have changed!**
- **Mach 1 is a curve for ulcers**
- **Gold-trimmed DC-7's for Eastern**

Here's a coincidence. The Douglas Aircraft Co.'s 1955 super-dooper, the XC-132, has the same wing area as its 1940 super-dooper, the B-19, had. It shows how the aircraft art has advanced. Remember the old B-19? If there ever was an underpowered sky giant, that was it. But it was widely hailed as "the world's largest bomber," which it was; it made headlines for Douglas and for the Army Air Corps, which needed 'em; and it certainly has to be counted as having contributed to the advancement of aviation. Empty, the B-19 tipped the scales at 80,000. Maximum gross takeoff weight was 160,000 pounds.

When Douglas rolled the big ship out of the hangar for the first time, the main gear cracked the paving of the Santa Monica airport's apron. All this weight was lifted by four Wright double Cyclones, which developed 2000 hp each for takeoff. Puny compared to what the P&W T57's will turn out for the XC-132. Matter of fact, the B-19's full power was just about what the XC-132 will get as a bonus from the added jet thrust of the four turboprop powerplants.

Recent Air Force expressions of air logistics interest make Douglas' chances with the 400,000-pound XC-132 transport look better than ever. The Phase 1 contract, including the wooden mockup hidden behind a big green curtain in the Santa Monica hangar, has been completed and it's understood Douglas has already started making hardware with Phase 2 money, although, at last reports, the Phase 2 contract itself for the building of a prototype still had not been awarded. The T57, which P&W has under development for the giant craft, is a turboprop version of that company's eminently successful J57 turbojet engine.

• •

Happiest scene on the western aviation front in a long time was the 7th floor of Convair's general office building in San Diego after the news came in that the F-102A had exceeded Mach 1 in level flight. Ulcers disappeared like magic and luncheon appetites were the heartiest in months. The folks at Convair have been confident all along that there was nothing the matter with their delta-wing interceptor that a few design modifications wouldn't fix, but there were some anxious moments from time to time nonetheless. The F-102A is the redesigned job with the coke bottle look. It might be added that its lost a little weight, too.

• •

We have just come upon this uplifting bit of information from the Pacific-Alaska division of Pan American World Airways:

"Stewardesses blouses — Year's use, by size.

30	4
32	113
34	117
36	56

The report adds that analysis of the trend over recent years has led to the establishment of a PAA stock number for size 38.

• •

Recent report shows Lockheed had 176 engineering people assigned to its F-104 project . . . Air Force Flight Test Center at Edwards Air Force Base now can boast it has the service's fastest aircraft, the nation's longest runway, and the world's tallest control tower . . . Looks like Canada has decided to get into the act. A Los Angeles employment agency advertises engineering jobs, which with overtime and per diem pay are described as the "equivalent of $1,200 a month," in the east and Canada.

• •

We're getting all-fired curious over the secretiveness at Douglas concerning the interior appointments of the Eastern Air Lines DC-7's. They'll be ultra-plush, our spies say. Trimmed in gold, no less. Should be wonderful for the Miami trade.

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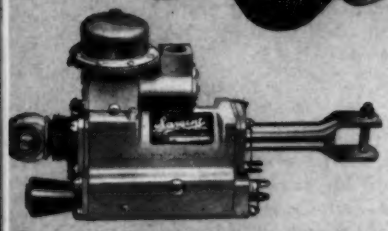
hydraulic, pneumatic and mechanical aircraft controls

1 Valve Assembly — Steering Metering

2 Main Landing Gear Retractor

3 Brake Valves



4 Power control units for rudder, elevators and flaperons

5 Slat Actuating Cylinder

6 Gear Box Assembly — Outer Wing Flap Drive

7 Pneumatic Door Lock

provide precision performance

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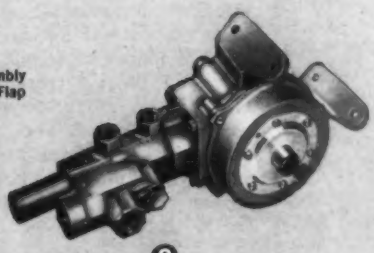

8 Spoiler Valve

9 Accessory Drive Power Take-off

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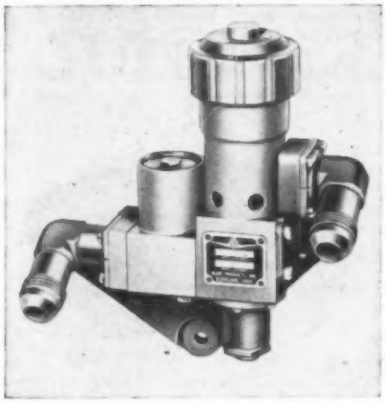
"Good will" is the disposition of the pleased customer to return to the place where he has been well treated.
—U. S. Supreme Court

New Products and Processes

Anti-G Suit Valve

A new automatic pressure regulating valve announced by Alar Products, Inc., for use with pilot anti-G suits accommodates compressor bleed air inlet pressures from 10 to 300 psi and temperatures from 65° to 400°F. De-



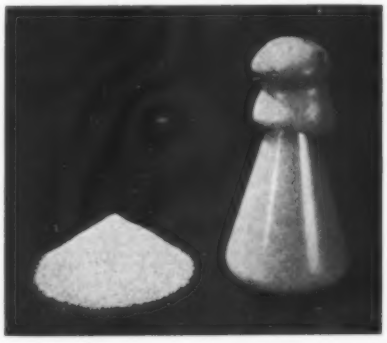
signed to meet Spec. MIL-V-9370 (1), the new Alar valve is adjustable for both high and low pressure increments. Literature available.

Circle No. 40 on Reader Service Card, page 93, for more information.

Foam Structures

New expansible resins for silicone foam structures are available from Dow Corning Corp. in the form of ready-mix powders. The mixes melt, foam, and cure by themselves when heated.

Three types, R-7001, R-7002, and R-7003, produce a graduated range of strengths for use at elevated temperatures and all remain stable up to 700°F. The mixes can be cast into sheets or blocks or made up as sandwich struc-



tures, and density can be varied from 8 to 18 lbs. per cu. ft. by varying expansion temperatures.

Suggested aircraft applications include those of core material for filling propellers and airfoils as well as a sandwich structure for radomes.

Circle No. 41 on Reader Service Card, page 93, for more information.

VHF Unicom

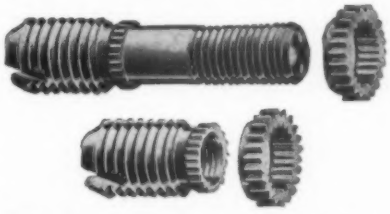
Availability of a new Model LTR-6GH two-way VHF ground-to-air com-

munications package has been announced by Lear, Inc., LearCal Division. Included are a turnable VHF receiver, a 10-watt crystal-controlled transmitter, built-in power supply, speaker and microphone.

Circle No. 42 on Reader Service Card, page 93, for more information.

Rosan Inserts

Rosan, Inc., has announced availability of ring-locked inserts and studs with a self-tapping thread. The new



feature is intended to prevent collapse of insert tapping segments during installation and the resulting damage to threads of mating bolts.

Circle No. 43 on Reader Service Card, page 93, for more information.

Permanent Magnet Motor

Airquipment Co., Inc., has entered production with a new miniature permanent magnet motor for high speed

aircraft and guided missile systems. Weighing only 3¾ ounces and measuring 2″ overall length, the motor is available in six different models with or without gear reduction units.

Featured are the use of mica insulated commutators and specially shaped and laminated field shoes. These combined with selection of optimum brush size are said to eliminate latching effect and permit use of the motor in servo applications.

Circle No. 44 on Reader Service Card, page 93, for more information.

Subminiature Motor

A new subminiature a-c motor introduced by Globe Industries measures 1 1/16″ in diameter and is available as either an induction or a hysteresis motor. Operation is from either 400 cycle or

60 cycle a-c supply, and military environmental specifications have been considered in the design.

Circle No. 45 on Reader Service Card, page 93, for more information.

Honeycomb Forming

New method of shaping aluminum honeycomb core to simple curvatures by use of sheet metal forming tools has been developed by Hexcel Products Co. Light gage sheet metal is placed on top and bottom of core material when bending in ordinary forming rolls. The sheet metal can be reused many times, as the forming forces bend only the stiffer honeycomb core.

Circle No. 46 on Reader Service Card, page 93, for more information.

VHF Transmitter-Receiver

Lear, Inc., LearCal Division has announced mid-1955 production availability of a new 800-channel VHF communications transmitter-receiver designed for single- or multi-engine executive or military aircraft. The Lear LTR-

800 consists of an 8-watt transmitter, receiver, and panel-mounted remote-frequency selector.

Weighing less than 25 pounds, the combined transmitter-receiver conforms to ½ ATR rack size. Sensitivity of the crystal controlled receiver is better than 1 microvolt for 500 mw audio power output. Spurious responses, including image responses, are not less than minus 60 db.

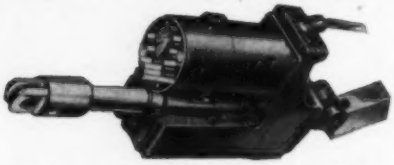
Frequency coverage of the LTR-800 is from 108 to 147.95 megacycles in 50 kc increments. Equipment is available for both 12- and 24-volt operation.

Circle No. 47 on Reader Service Card, page 93, for more information.

Miniature Actuator

A new compact linear actuator developed by Lear, Inc., Grand Rapids Div. for such applications as trim tab operation or fuel dump chute actuation is small enough to permit installation within control surfaces of jet aircraft. The Lear Model 413 series ranges in weight from 1.7 to 2.4 pounds, and largest actuator measures only 1⅞" x 3 3/4".

Ultimate structural strength of the units in both tension and compression ranges up to 2000 pounds, maximum static strength up to 1300 lbs., and operating output 500 lbs. Featured in design is a new limit switch system

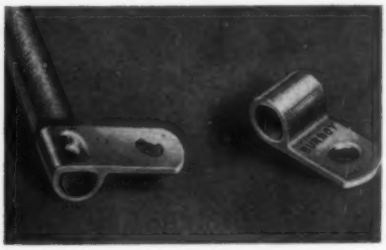


which permits more accurate positioning of stroke length by eliminating backlash normally encountered in gear trains.

Circle No. 48 on Reader Service Card, page 93, for more information.

Flag-Type Terminal

Newest development of Burndy Engineering Co., Inc., is a flag-type, extruded terminal which permits side entrance installations in aircraft where



space limitations preclude use of straight or right angle lugs.

New terminals are available in the tin-plated copper (Type YBM-L) in sizes #8 through 2/0 and in tin-plated heavy-wall aluminum (Type YBM-A-L) in sizes #8 through 4/0.

Circle No. 49 on Reader Service Card, page 93, for more information.

Sampling Switch

General Devices, Inc., has introduced a new precision high speed sampling switch for guided missile applications which measures only 2 3/8" diameter by 1 7/16" long. Specifications

of typical switch provide 60 contacts, 30 channel single pole arrangement, and sampling rates up to 60 revolutions per second.

Circle No. 50 on Reader Service Card, page 93, for more information.

YOUR
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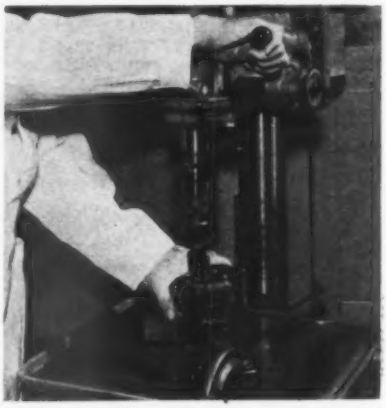
A BRILLIANT FUTURE...

Bendix Missile Section is a major contractor in the U. S. Navy's guided missile program--a part of the "new look" in our defense plan. Our expanding program has many opportunities for senior engineering personnel: Electronics Engineers, Dynamicists, Servo-Analysts, Stress Analysts, Project Coordinators, and Designers. Take time now to look into the opportunities which Bendix can offer you. Write Employment Dept. M, 401 Bendix Drive, South Bend, Indiana.

Circle No. 22 on Reader Service Card.

Torque Wrench

First true powered torque wrench with fully automatic accurate release is claimed by Torque Corporation of



America for its new Pow-OR-Tork unit recently developed. The Pow-OR-Tork can be designed for air power, standard 60-cycle or high-cycle use. Licensed manufacturer is Ohlsson & Rice, Inc.

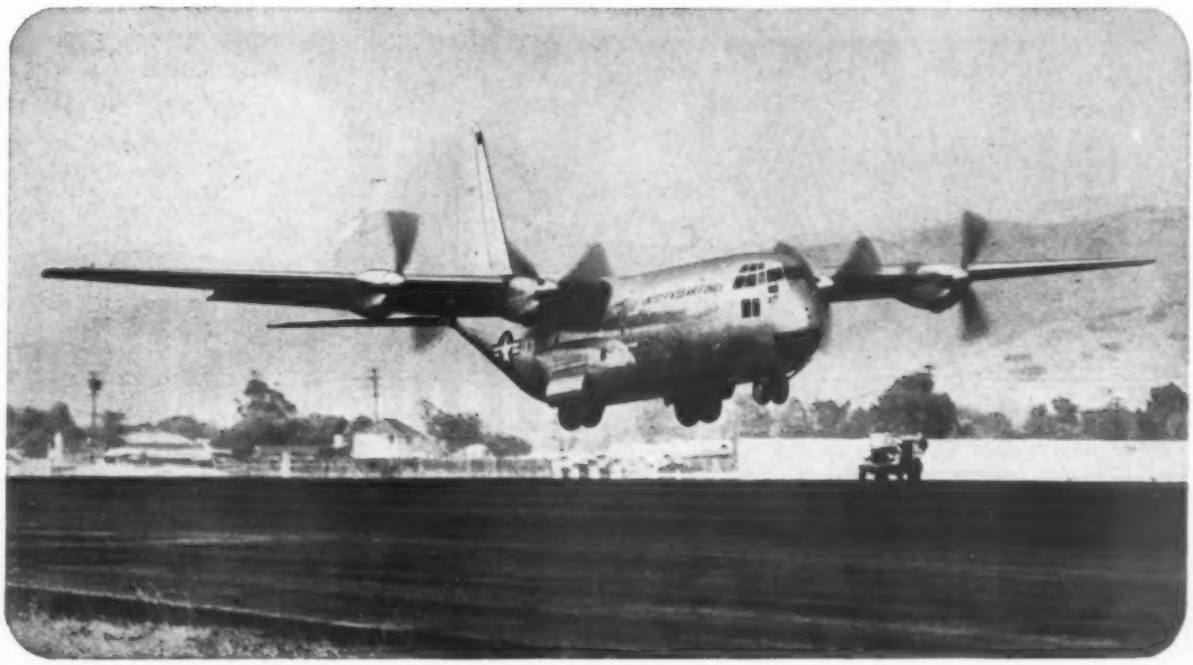
Circle No. 51 on Reader Service Card, page 93, for more information.

Torque Gages

Four new "Torque-Watch" gages now being marketed by Waters Manufacturing, Inc., are especially designed for measuring torque on servo mechanisms, variable condensers, potentio-

New Turbine-Powered Cargo Carrier

hauls big pay loads faster



Allison T56 Turbo-Prop Engines Power New Lockheed YC-130 Transport

The initial flight of the YC-130 Medium Cargo Transport marks another great forward stride in transport aviation.

This giant carrier, built by Lockheed for the U. S. Air Force, is the first U. S. A. F. cargo plane designed from the very beginning for Turbo-Prop engines.

Powered by four of the new Allison T56 Turbo-Prop engines, this great new cargo airplane can haul heavy pay loads long distances at speeds required by our new modern combat jet Air Force. It is ideally suited to carry many types of heavy military equipment, on either long-range operations or in close support of troops. It also can be fitted as a combat troop carrier or an ambulance plane. The YC-130 can operate from shorter runways with greater rate of climb than either reciprocating or Turbo-Jet engine aircraft.

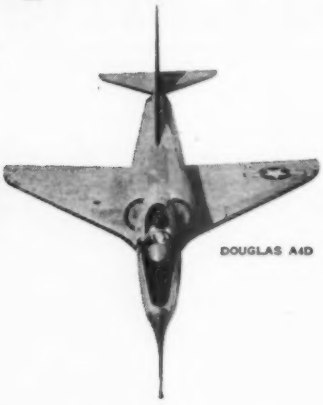
All this, plus its economical use of lower cost fuel, label the Turbo-Prop engine as the "work horse" power for future transports. And Allison, with its unmatched experience in high-powered Turbo-Prop design and manufacture, today offers both T56 and T40 engines to serve a broad range of modern flight requirements.

GM GENERAL MOTORS Allison Division of General Motors, Indianapolis, Indiana

DOUGLAS RB-66

Today's aircraft...

tomorrow's, too



DOUGLAS A4D

CONVAIR XFY-1

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Virtually every military or commercial aircraft in the air today has one or more Western Gear units aboard to make the pilot's job easier and to insure successful flight. And on Western Gear design boards are plans and specifications for gear drives for tomorrow's aircraft, for flight that is projected three, five . . . even ten years from now.

Western Gear has designed and manufactured every type of aircraft mechanical power transmission equipment – actuators, accessory drives, complete control systems and dozens of other applications – for every type of flight, piston engine or jet, guided missile or rocket.

There's a vast store of experience crowded in the 66 years since Western Gear first opened its doors for business in San Francisco. It's always available at no obligation to help you solve your mechanical power transmission problem, backed by the facilities of six plants located throughout the West. Write today for information. Address Executive Offices, P.O. Box 182, Lynwood, California.

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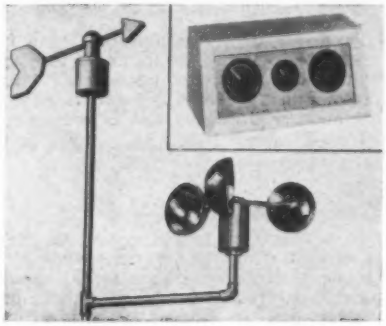
meters, and small rotating machinery.

Models 6000-1 and 6000-3 record 0.010 to 1.2 in. oz. clockwise and counterclockwise, respectively; models —2 and —4 register 1.0 to 20 in. oz. clockwise and counterclockwise.

Circle No. 52 on Reader Service Card, page 93, for more information.

Weather Instrument

Measurements of winds up to 85 mph, 360 degree wind direction, and outside air temperatures are all possible with a new low-cost Wind-O-

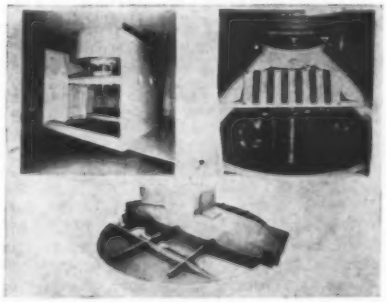


Meter introduced by Aircraft Components, Inc. Priced at $99.50, the AC-2 Wind-O-Meter consists of an outside sensing unit connected electrically to an indoor desk-top indicator panel.

Circle No. 53 on Reader Service Card, page 93, for more information.

Rotary Accelerator

Electronic and electro-mechanical components weighing as much as 500 pounds can be tested up to 100g loads on a new accelerator produced by Schaevitz Machine Works. Called the Model T-16A, the new test equipment has a 16 ft. long rotating test arm which is installed in an 18 ft. diameter



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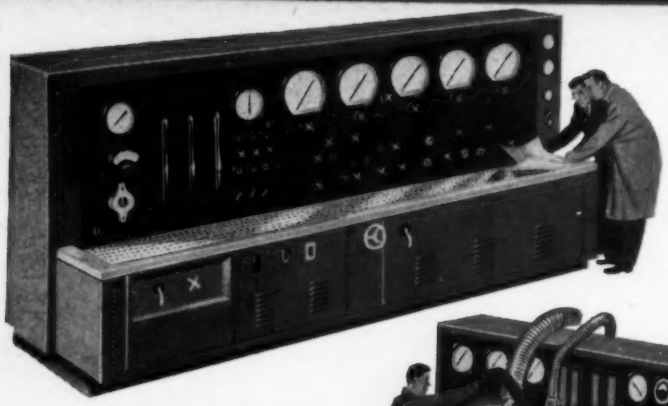
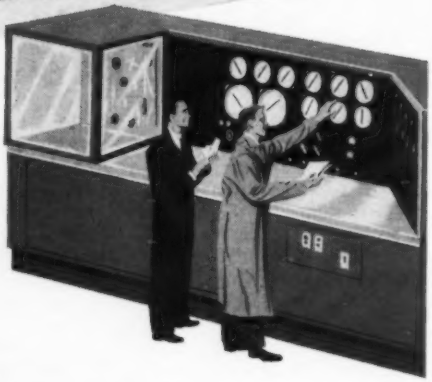


Universal Hydraulic Test Machine for high pressure, high output pumps and accessories. Made in pressures up to 5,000 psi, flows to 100 gpm, with variable speed drives up to 4500 rpm.

Aircraft Heater Test Machine tests all makes of internal combustion heaters rated up to 270,000 btu/hr. Other models available to 600,000 btu/hr.

IN WORK AT GREER

Confidence in the maker has made Greer first and foremost in aviation test equipment. That's why leading aircraft manufacturers and airlines specify Greer. Like in the precision test machines shown here passing final inspection, they can rely on Greer for absolute accuracy, dependability and long, trouble-free service. Call our expert engineers, or write for free catalog.



Universal Pneumatic Test Machine handles all accessories with vacuum to 29" hg abs at 9 cfm and pressures to 6,000 psi. Varying capacities on your specifications.

Aircraft Oil Valve Test Machine checks the operation of thermostatic control and surge relief valve of oil radiators under low, high, and normal temperatures.

Cabin Leakage Test Machine used to ground test pressurization. Seals by pressure drop or air flow methods. Handles flows to 1000 cfm, pressures to 10 psi. Other models available on your specifications.

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TEST EQUIPMENT

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Circle No. 25 on Reader Service Card.

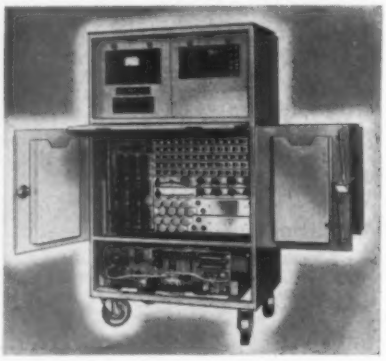
pit supplied by the user.

The T-16A is powered by a 30 hp d-c motor operating from a 440 volt, 60 cycle a-c controller. An optical system which permits observation of test objects as if they were stationary is optional equipment.

Circle No. 54 on Reader Service Card, page 93 for more information.

Circuit Tester

Bogue Electric Mfg. Co. has introduced a new automatic electric circuit tester said to be capable of checking out several hundred circuits in a matter of seconds. Once started,



the Bogue tester examines each circuit individually, compares its characteristics with known preset standards, then automatically moves from one circuit to another until the test is completed.

Circle No. 55 on Reader Service Card, page 93 for more information.

Small Blower

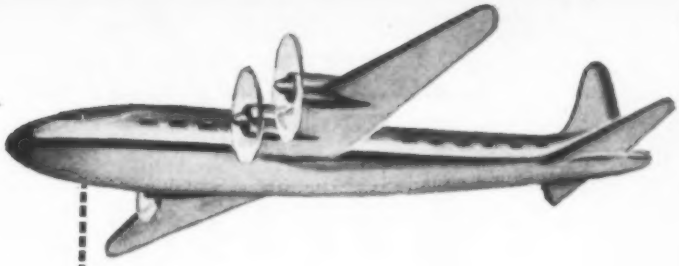
Servomechanisms, Inc., is producing a new 20-ounce blower for cooling airborne electronic equipment that measures less than 3½" in its largest dimension and is rated at 70 cfm output

at 1" H_2O static pressure. Operation is directly from 115 volts, 400-cycle supply, in conjunction with a phasing capacitor.

Circle No. 56 on Reader Service Card, page 93 for more information.

Miniature Potentiometer

A new miniature low torque potentiometer measures only ⅞" in diameter and has an accuracy of ±0.1% for linear and 0.25% for sine and similar functions, according to its producer Gyromechanisms, Inc. Weight of



THE Bendix FLUSH ADF LOOP ANTENNA

It's the newest automatic radio compass for high speed aircraft. It's the new Bendix* LPA-70A ADF antenna that is flush mounted, completely eliminating drag.

Designed to be usable with present MN-62 compass or the future DFA-70, it provides equal or greater sensitivity than present day loops.

Recessed mounting of the Antenna reduces precipitation static because there are no projections . . . no exposed areas.

Location of the Bendix Flush ADF Loop Antenna may be either on the top or lower surface of any aircraft.

Now in production. Write to Bendix Radio, Baltimore 4, Maryland.

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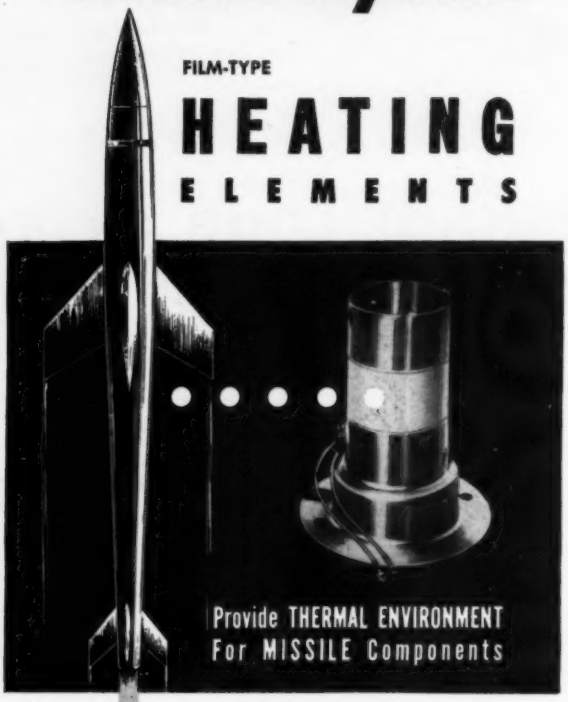

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Weight 1/10 lb. per sq. ft.; only .012 thick (including terminals and busses)

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Near zero thermal inertia. Reduces power requirements due to maximum heat transfer properties

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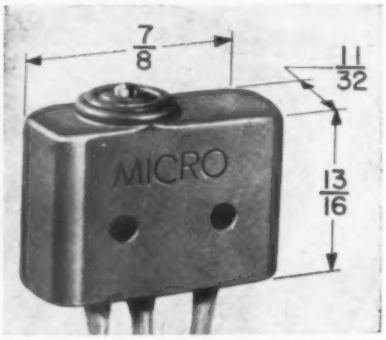
the unit is 1 oz. for one section and .25 oz. for each added section.

Designed for vibration of 10g to 500 cycles and shock loads of 60g, the model 36000 potentiometer can be obtained with a resistance value from 200 ohms. Starting torque is .05 in. oz. for one section and .03 in. oz. for each added section.

Circle No. 57 on Reader Service Card, page 93, for more information.

Subminiature Switch

Smallest and lightest sealed precision snap acting switch available is the description by Micro Switch, Div. of Minneapolis-Honeywell Regulator Co. for its new ISEI series. Measuring



only ⅞" wide by 21/64" high by 11/32" thick, the new Micro switches are tentatively rated for 30 volt d-c, 2.5 ampere inductive and 4 ampere resistive loads.

Circle No. 58 on Reader Service Card, page 93, for more information.

Hose Assembly

On-the-spot assembly of new high temperature aircraft hose is now possible with a portable tool developed by Resistoflex Corp. Designed for use with

its Fluoroflex-T R500 hose for newer fuels and synthetic lubricants, the tool consists of a crimping unit, hydraulic pump and necessary accessories fitted into two carrying cases that can be handled and operated by one man.

Circle No. 59 on Reader Service Card, page 93, for more information.

Silicone Fabric

Cohrlastic 2804, a new silicone rubber-coated fabric announced by The Connecticut Hard Rubber Co., weighs only 4.5 ounces per square yard and is designed for use as electrical insulation, gasketing and diaphragm material.

Base glass fabric is a new .001" cloth coated to minimum thicknesses. This cloth has been silicone rubber

SIMPLE...VERSATILE...LIGHT...MOST PRACTICAL ANTENNA TUNER YET!

THE AER-O-COM MODEL AAT TYPE 4 AUTOMATIC ANTENNA TUNER

The new Aer-O-Com automatic antenna tuner is the complete answer to antenna tuning for all commercial aircraft, for it tunes all fixed wire antennae, grounded or open, on all aircraft from DC-3's to B-377's!

It's the lightest on the market—just 16½ pounds. It tunes rapidly and effectively. It's simplicity means lowest cost and easy maintenance.

Aer-O-Com's Model AAT, Type 4 Automatic Antenna Tuner . . .

FITS YOUR NEEDS BECAUSE...

Meets essential requirements of ARINC Characteristic #525.

Operates efficiently into all fixed wire antennae, grounded or open, over the frequency range 2-22 mcs, for all sizes of aircraft ranging from DC-3 and CV-340 to DC-7, L-1049 and B-377.

Simplicity, dependability, light weight. Rotating circuit parts consist of one standard type variometer, one standard type variable air capacitor, and one element selecting switch. Uses only one vacuum tube, 2D21 (5727). Dependability assured by simplicity of parts and design.

Average 5 seconds tuning time for typical international frequency plan (2-22 mcs) on DC-6B. Maximum tuning time 15 seconds.

Requires no frequency information from transmitter or selector switch, therefore can be used with any type of H.F. transmitter having a 52 ohm coaxial output, a nominal carrier power of 50 or 100 watts, and providing necessary control for the tuner.

Requires only 27.5 VDC primary power (1A standby and transmitting, 3A tuning); 50 MA at 400 VDC for only 1 second during tuning cycle.

External RF relays not required, even for dual installation. Tuner is fitted with two front panel mounted RF relays for optional use. One relay operates with P-T circuit and may be used to transfer antenna directly to receiver input circuit; the second relay is used in a dual installation, to ground the antenna when the other transmitter is being used.

AER-O-COM EQUIPMENT for your complete communications needs!

Here are the companion pieces to the Model AAT, Type 4 Automatic Tuner: all of which operates on 27.5 VDC (no 400 cycle power required)

Model AT-144 Airborne Transmitter: Frequency range 1.6 - 1.75 and 2.0 - 22.0 mcs covering 144 independent crystal controlled frequencies. Weight 44 lbs. Separate transmitter and receiver permit cross-band operation.

Model AR-144 Airborne Receiver: Has a frequency range of 2.1 - 18.5 mcs. covering 144 crystal controlled frequencies. Weighs 33.2 lbs.

Model DPU Power Unit: Proven dynamotor type, 33 lbs.

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A-110

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This corporation and executive market is a stabilizing influence on BEECHCRAFT's volume of production, which actually consists of a major portion of military work and a lesser portion of commercial work.

BEECHCRAFT is aggressively entering new fields and needs skilled engineers to do creative work of top-level quality in these fields. If you would like to be associated with a leading organization that is large enough to have diversification of product, but small enough to insure recognition of personal ability shown by those who have it, and if you do possess superior skills in the categories first mentioned, write to –

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Beech Aircraft Corporation, Wichita, Kansas, U. S. A.

coated to .007" and .010" thicknesses for increased air permeability.

Dialectric strength of the new fabric is 1100 to 1400 volts per mil and useful temperature ranges from -70° to 500°F.

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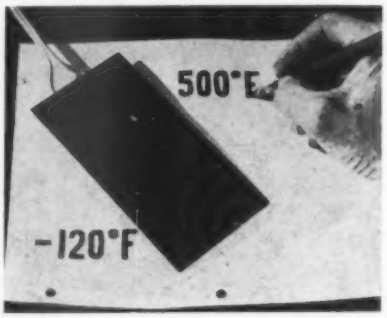
Film Heating

A non-plastic, film-type heating element developed by ThermLab Corp. operates in temperatures up to 500°F. and watt densities of 40 watts per

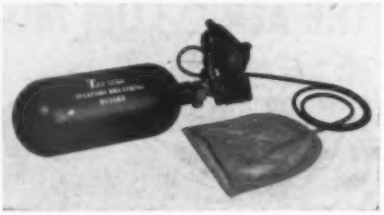


square inch. Of inorganic makeup, the new element is said to be unaffected by hydrocarbons, most acids, and climatic conditions.

Circle No. 61 on Reader Service Card, page 93, for more information.

Portable Oxygen Unit

A new low-cost portable oxygen breathing unit has been developed by Zep Aero for executive aircraft opera-

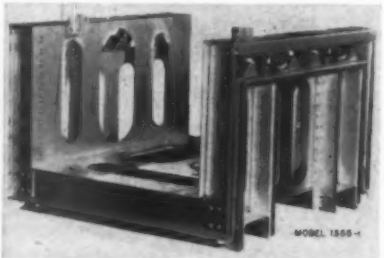


tors. Unit includes cylinder, regulator, and disposable masks, and several sizes of cylinders are available to meet varying requirements.

Circle No. 62 on Reader Service Card, page 93, for more information.

Mounting System

All-metal mount for use in helicopters has the resilient center coinciding with the center of gravity of the equipment. Vibration is isolated from



9 cps up. Mount may be tilted as much as 45° about transverse axis without appreciable change in performance. Manufacturer is Robinson Aviation, Inc.

Circle No. 63 on Reader Service Card, page 93, for more information.

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America's Leading Airline **AMERICAN AIRLINES** INC.

Transport Aviation

TWA's New Overhaul Base: Designed for Efficiency

IT'S rare when an airline has the opportunity to plan the details of a new overhaul base from the ground up; yet that's exactly what Trans World Airlines is doing these days.

It seems more the rule than the exception that airline overhaul bases are housed in plants built for other purposes, many of them for military aircraft modification during World War II. In the case of TWA it has been a war surplus North American B-25 modification center at Fairfax Airport, Kansas City, Kan. Since it moved there in 1945 the airline has "stretched" it to the bursting point to maintain its 150 twin- and four-engine transports.

But from now on KCK (the airline's code for its present facility) is just a temporary headquarters for TWA overhaul. Ground breaking for an $18.7 million plant at Kansas City's new Mid Continent International Airport is a matter of history and now TWA officials are putting the final touches on a $4-6 million plan for "interior furnishings" to give it the most modern overhaul installation in the airline industry.

Spearheading this phase of the program for TWA under engineering and maintenance director R. M. Dunn is J. T. Davis, base facilities planning manager. In an exclusive interview with AMERICAN AVIATION, here's how Davis sizes up the new base compared with the present operation:

• **Aircraft Hangars**—Two huge hangar areas 816 ft. long and 160 ft. wide scheduled for completion July 1, 1956, will handle nine 4-engine and two twin-engine aircraft compared with six 4-engine and two twin-engine aircraft at KCK. Joined by a three-story office and shop area, it will increase the airline's aircraft overhaul working area some 106%.

• **Engine Overhaul**—Due for completion in September of this year is Building No. 2, a 410 ft. wide by 435 ft. long "self-sufficient" engine overhaul shop. Its 115,800 ft. area represents a 40% increase, and capacity will permit overhaul of seven engines per shift.

• **Dynamometer Test Cells**—New to U.S. airline operation will be Building No. 3 housing five 5000 horsepower dynamometer engine test cells also slated for completion in September 1955. Built to the airline's specifications by Clayton Mfg. Co. of El Monte, Calif., the first of these units is now undergoing a 500-hour shakedown test at KCK after which it will be dismantled and studied for possible design improvement of production models.

• **Reduced Stores Area**—By emphasizing "on the job" stocking of expendable parts and development of an efficient conveyorized parts supply system, TWA planners have been able to cut overall stores area by about 20%. Of 135,000 sq. ft. planned stock area, about 25% will be double-decked bringing the total area to 168,000 sq. ft.

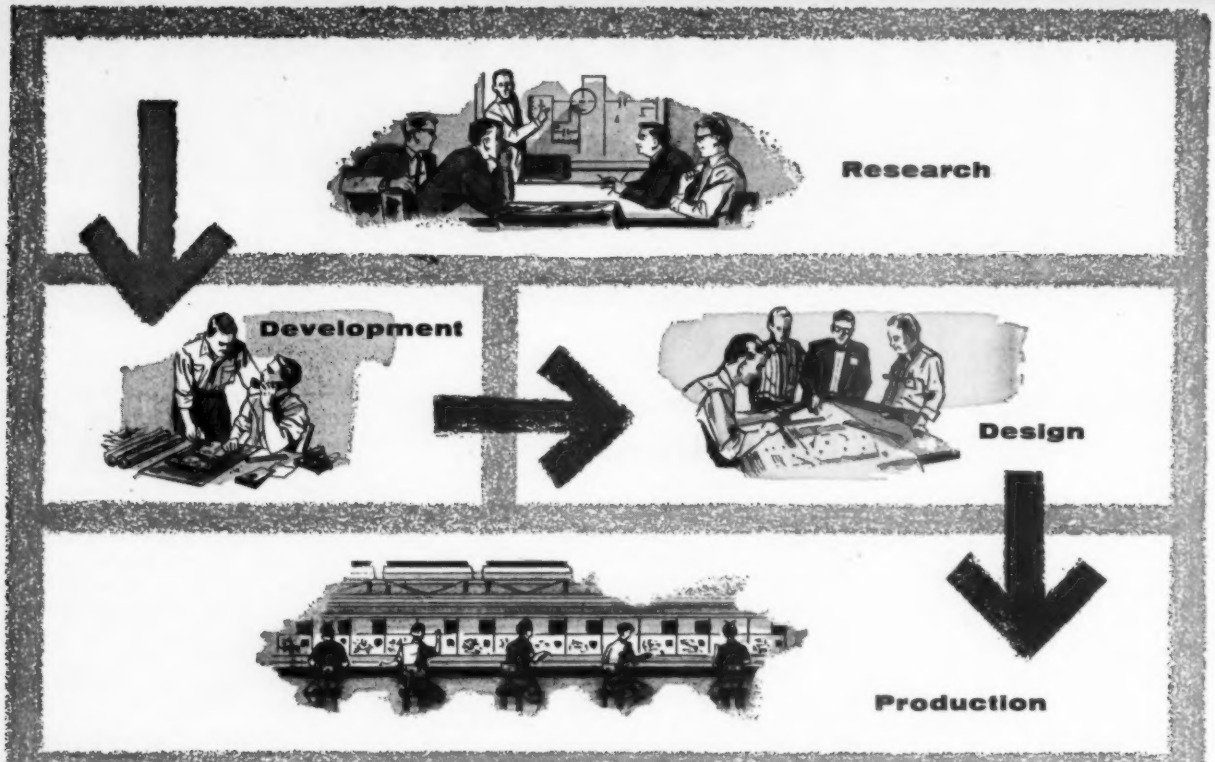
Throughout the planning of the new base TWA's approach has been to find the best and most efficient way to do every job. Time and motion studies were conducted on virtually every major accessory overhaul and the ultimate repair point for the unit in the master shop plan was spotted accordingly.

Although TWA officials aren't claiming much in the way of radical new ideas on aircraft and engine overhaul, they are justifiably confident that they have concentrated more of the best ideas on the subject into a single facility than can be found anywhere else. Since early in the program its engineers have visited every major airline and military overhaul depot comparing the merits of one approach with another.

The three most impressive elements of the finished base will be the engine overhaul shop, the parts conveyor system, and the new test cells. In its engine shop TWA departs from past thinking that any shop duplication, whether it be for component overhaul, machining, or any other service, is basically inefficient. The new engine shop instead will be completely self-sufficient with all of the necessary machine tools, accessory overhaul stations and test stands solely for engine work regardless of their possible duplication in the aircraft overhaul plant.

Functional layout of the shop area will provide for movement of engines down the right-hand side on a disassembly line (see chart, p. 75) and as parts are removed they will be fed to adjacent overhaul stations on the left. As they progress through various stages of overhaul and test they will finally arrive

Drawing shows new base, twice as big as present facilities.



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Transistors

Hoffman's reputation for getting things done is due, in part, to the unification of Research-Development-Design-Production into one closely integrated electronics operation. At Hoffman – instead of the usual four completely separate operations – one technical director is assigned to co-ordinate each new project from start to finish. Every new project is developed in close cooperation with the divisions ahead, including the practical problems of quantity production. This integration practically eliminates the all-too-common duplications and overlapping of functions, the errors and re-work caused by poor liaison, and materially cuts down the usual time lag between the testing of the prototype and actual production. Hoffman has become a leader in electronics by doing progressively complex jobs – to specifications – to cost estimates – and on schedule.

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opposite their appointed position in the build-up line on the left side of the shop.

• **Proposed engine cleaning** equipment will call for a seven-stage completely automatic installation for basic engine parts less cylinders, pistons and valves. Stages will consist of one degreasing, four decarbonizing, and two rinsing operations. Tentative plan for cylinder cleaning is a single degreasing operation most likely by vapor techniques followed by a semi-automatic seed blasting of required areas. Sheet metal cleaning will employ large agitator washing machines, and exhaust segments will use semi-automatic shot blasting cabinets. TWA plans to clean oil radiators with hot trichlorethelene.

Replacement parts needed to keep the engine overhaul line moving will be fed into the shop at seven strategic "drops" by a 1400 ft. long monorail conveyor system from the base's main stores area on the floor below. For bulky parts movement, wide aisle areas (10 ft. wide at the least) are routed generously throughout the shop.

What is believed to be the longest conveyor system in airline use is in the plan for TWA's aircraft overhaul area. Joining main base stores via an underground tunnel leading to the hangar building will be a 4200 ft. long monorail conveyor that will serve 13 aircraft and accessory overhaul stations, then return to main stores.

• **Down-line stations** on the conveyor system will require no full-time attendant. Unloading will be automatic, controlled by a destination selector which the loading clerk will choose when the load is dispatched. Speed of the conveyor will be about 60 feet per minute bringing a carrier to any station about every 20 seconds.

Supplementing these two systems will be a third belt-type conveyor joining all sections of the main stores area. Here, too, an automatic discharge system with electrically selected air ram diverters will be employed to free stock clerks from continuous monitoring of parts in transit.

Probably the most extensive study in the entire planning program centered around the selection of the dynamometer type engine test cells. Cost of a single modern cell of the conventional type with adequate sound treatment, TWA estimates, would be about $415,000 and it would handle engines up to the Wright DA-3 turbo compound. Even larger units to accommodate piston engine powers above the DA-3 (a 30′ x 30′ cell) would cost as much as $750,000 each.

Five of either type, needed to meet its engine overhaul output, the airline concluded, would bring the total cost between $2 and $4 million. Despite their modern design it would still require 2½ to 3 hours to install an engine for test.

Working with engineers of Clayton Mfg. Co., builder of the bulk of automotive dynamometers, TWA found it could satisfy even the most optimistic predictions of future piston engine power ranges with five 5000 hp dynamometers costing about $1.2 million total. As an added bonus with such an installation, the airline discovered that test cell area could be cut 45% below that now used and test cell time to hook up and start an engine test could be sliced to a phenomenally low of only seven to ten minutes.

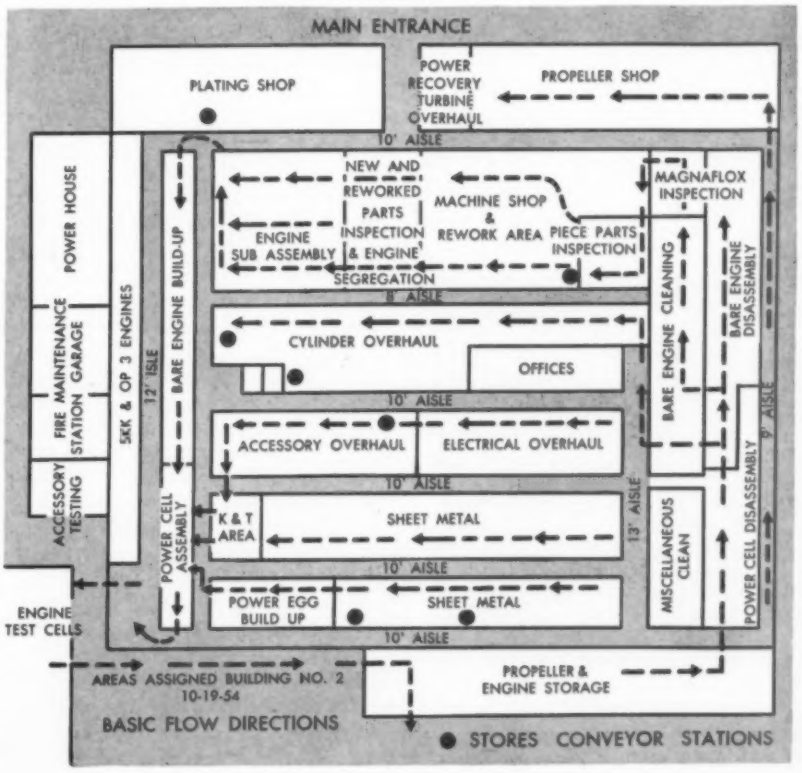
• **Time-saving secret** of this latter operation will be a special test cell cart on which the engine will be mounted and to which all instrumentation and control wiring and plumbing will be connected. On the dynamometer end of the cart special couplings will connect them to test cell supply sources and instrumentation as a hydraulic ram mates the engine with the dynamometer.

Another favorable by-product of using dynamometers for engine testing will be its power generation to heat and air-condition the overhaul base. TWA figures to five units will produce about 13,200 pounds of steam for heating, or sufficient to run a steam turbine that will operate compressors producing up to 800 tons of refrigeration. The TWA dynamometers will also be the first on which an aircraft engine can be run on its normal shock mount system. During engine operation, special constant velocity universal joints permit engine shaft movement up to 5° from alignment to compensate for normal vibration.

• **Cost of the new base** will be no small item for TWA. Over the next 30 years the airline will be paying better than $1,000,000 annual rent to liquidate a revenue bond issue floated by Kansas City. Once paid for the structures will be wholly owned by the city and presumably TWA's rent will come down considerably.

Although $1 million a year may seem high rent for an airline overhaul base (it compares with $60,000 TWA now pays at Fairfax), the advantages it will gain are bound to offset a good share of this cost. For on the high ground of Platte County, 14 miles northwest of Kansas City, the airline will be permanently removed from the flood threat of the Kansas and Missouri Rivers. In 1951 alone, TWA's bill for flood damage not covered by insurance came to better than $2 million, not to mention potential revenues it lost while the base was temporarily out of commission.

Flow chart traces TWA's overhaul operations.



No-Shows Cost Carriers $5.5 Million But the Record Is Improving

BY ERIC BRAMLEY

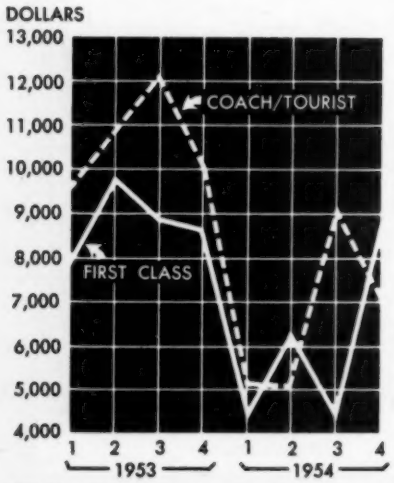
DOMESTIC U. S. AIRLINES lost an estimated $5,599,200 revenue from no-shows in 1954, but it is probable that a substantial part of that loss was the fault of the carriers—not the passengers.

At that, the $5,599,200 is a far cry from the estimate of $27 million annual lost revenue that was made about three years ago. That figure, which was not based on a sampling program such as is now in effect, caused raised eyebrows among the airlines and at the Civil Aeronautics Board. The carriers were told by CAB to solve their no-show problem as a means of getting more cash rather than petitioning for fare increases.

That the industry is improving its no-show situation can be seen from the following "lost revenue" figures:

	1953 (*dollars*)	*1954* (*dollars*)	*Change* (*percent*)
1st Class	5,526,900	3,980,400	—28
Coach .	1,694,000	1,618,800	— 4
	7,220,900	5,599,200	—22

The present no-show sampling program, conducted by the Air Traffic Conference (first reported in AMERICAN AVIATION, Oct. 12, 1953) consists of reports received from airline offices throughout the nation. Even though the percentage of no-shows to boardings may be relatively high (9% first-class, 7.9% coach/tourist in 1954), lost revenue, as calculated in the sampling program, is not correspondingly large.



REVENUE LOST FROM NO-SHOWS (Based on each million dollars of passenger revenue.)

The program's rules are:

- If total available seats on an airplane are never sold, there can be no "lost" seats on account of no-shows.
- If total available seats are sold and stay sold, no loss.
- If total seats are sold and then re-sold, no loss.
- If available seats are once sold, but no-shows reduce boardings to less than capacity, there's a loss if there was a waiting list; there's no loss if there was no wait list.

In other words, if a no-show prevented some other passenger from being sold, then there was a loss.

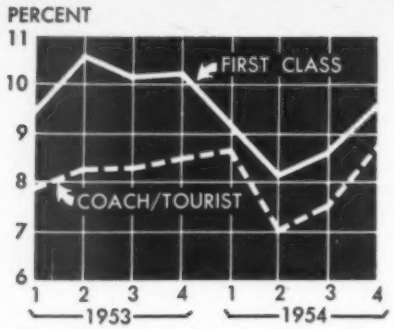
Example: 50 people are booked on a 60-passenger airplane. Ten people no-show; there are no stand-bys or wait list; flight departs with 40. There are no "seats lost," because no-shows didn't prevent other passengers from being accommodated.

Example: 60 people are booked on a 60-passenger airplane, and 10 no-show. There are five stand-bys and five on the wait list. Flight departs with 55. There are five "seats lost," because five other passengers could have been accommodated.

The $5,599,200 lost revenue figure may be inflated because the sampling program is based on wait list information. And another survey conducted a few months ago showed that these lists may not be accurate.

The survey, under direction of Tom Miles, director of interline reservations procedures for ATC (and who also handles the sampling program), was conducted for one week on one of the nation's heavily traveled air routes, served by four airlines. Miles was furnished with all reservations cards covering all flights.

The records of three of the carriers (the fourth does not retain wait list information) showed 125 wait list passengers. However, Miles' analysis of the reservations cards showed that 70 of the 125, or 56%, *actually flew*. In other words, because of procedural or clerical errors, wait lists were higher than actual. Thus, if this admittedly small sample were typical of nation-wide performance, "lost seats" and "lost revenue" reported in the sampling program would be over 50% higher than actual.



PERCENT OF NO-SHOWS TO BOARDINGS

The survey produced other significant findings:

- Of 4,547 passengers surveyed, 3,028 flew as scheduled. A total of 1,394 canceled, misconnected or no-showed one flight, but 496 (35.6%) of these *used another flight.*
- No-shows totaled 248 (8.2% of boardings), but 60 of these (24%) *used another flight.* Eight of the no-show passengers *actually flew on the same flights they had reportedly no-showed.* And 25 of the 248 departed on earlier flights of the original carrier or via another carrier. Their names were left on the cards for the later flights and they were classified as no-shows.

It was estimated several years ago that 80% of the no-shows were caused by personnel errors and by procedures, while only 20% were caused by passengers who made reservations and then failed to show up. The validity of the 80-20 estimate has not been checked in the past couple of years, but the recent survey on one route seems to indicate that far from all of the fault is the passengers'.

Some airline officials believe the sampling program and the route survey furnish strong arguments against a no-show penalty system. They point out that the first-class no-show situation has shown more improvement than coach, despite the fact that there's a penalty on coach and none on first-class. Also, if over 50% of the no-show problem is the airlines' fault, why penalize the passenger?

As to what would be necessary in the way of additional personnel, communications facilities, new procedures, training, etc., to eliminate the airlines' errors, there's some feeling that the carriers might find themselves spending $2 to save $1.

However, these opinions are not

unanimous in the industry. American Airlines, in particular, has stated emphatically that its no-show problem is serious enough to merit extension of the penalty system to first-class flights. In support of its argument it points to the success of British European Airways, which reported that a 25% penalty, rigidly enforced, cut no-shows from 70 to 27 per 1000 boardings.

At the Air Traffic Conference meeting in November, the penalty question was again considered and the vote was against extension to first-class. However, it can be expected to come up again.

The ATC sampling program is also significant in that it shows that although there are more no-shows on first-class than on coach, the revenue lost (based on each $1 million of passenger revenue) was greater on coach than on first-class. The coach loss per $1 million passenger revenue was $7,100 in 1954, against $6,200 first-class.

Possible reasons for the higher percentage of no-shows on first-class are (1) the penalty system on coach; (2) industrywide, there's a higher frequency of first-class service than coach; therefore coach passengers are less likely to switch flights and unknowingly end up as no-shows on their original flights; (3) businessmen riding first-class are more likely to no-show than occasional coach riders.

On the other hand, the higher loss per $1 million passenger revenue on coach may be attributed to the fact that capacity and demand are in better balance on first-class. In other words, when there are no-shows on a first-class flight there are probably also other empty seats and no wait list. The no-shows don't keep other passengers from riding, so there's no revenue lost. On coach, however, less frequency may result in capacity bookings and wait lists. In turn, no-shows result in lost revenue.

Fact Board Named In Machinist Dispute

Members of the emergency fact-finding board set up by the White House Nov. 16 to avert a strike of 20,000 machinists against six airlines were named by President Eisenhower as 1954 came to a close.

Chairman is Judge Adolph A. Wenke, associate justice of the Nebraska Supreme Court. Other members are attorneys—James P. Carey, Jr., Chicago, and Francis J. Robertson, Washington, D. C.

The board was scheduled to meet with representatives of the International Association of Machinists and Eastern, Capital, TWA, United, National, and Northwest Airlines in Chicago last week.

RESOLVED MOODBEAMS #2

In making New Year Resolutions, why not string along with Yvonne Erwin (21, 5'7", 118 lbs., brown eyes, brown hair), MISS TEXAS OF 1954? She has tasseled a tip to remember what she disremembered last year — whatever that was — and, with a woman, who knows? With a pilot, tho, it may have been Southwest Airmotive de-icing, anti-icing, or heater service. Resolve now to profit from SAC's extra margin of safety and reliability in new installations, periodic checks, and repairs!

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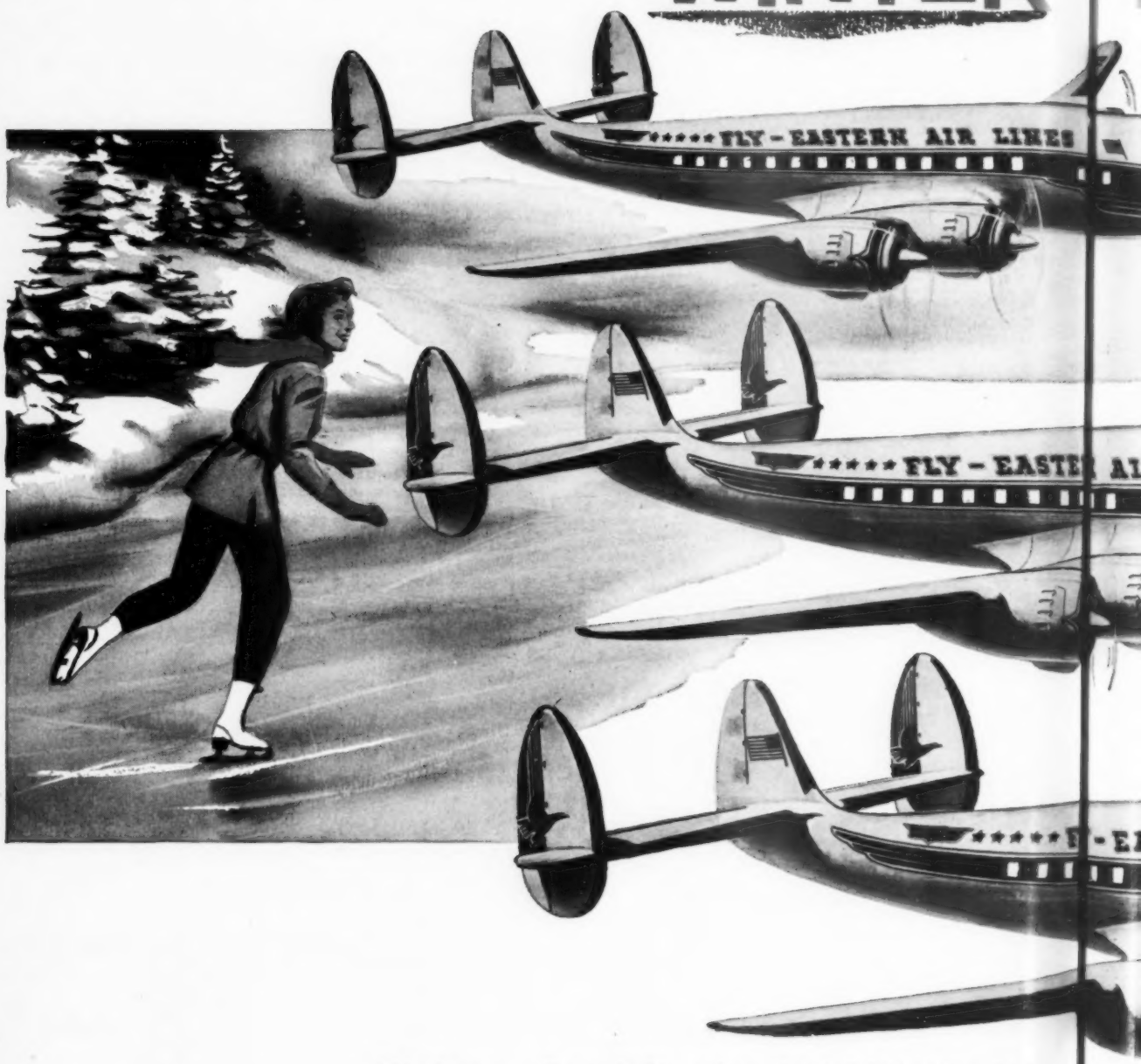

This winter season, Eastern Air Lines estimates that via their Great Silver Fleet more than 700,000 people will exchange frigid toes for a sunburned nose.

As these carefree passengers rely on Eastern's reputation for fast, reliable transportation to Florida, so does Eastern rely on Sinclair Aircraft Oils *exclusively* for dependable aircraft engine lubrication. *Today, 45% of the oil used by major scheduled airlines in the U. S. is supplied by Sinclair.* Why not place *your* confidence in Sinclair Aircraft Oil?

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into SUMMER...

...SINCLAIR AIRCRAFT OILS

By William V. Henzey

Chances Look Good as Local Lines Renew Certification Fight

THE LOCAL SERVICE airlines expect to wage a new Congressional fight for permanency this year, but the fight will be under drastically changed circumstances from those surrounding the 1954 effort which barely missed success when Congress ran out of time in August.

Instead of seeking permanency as a means of survival, the situation now appears to be one in which survival is virtually assured (thanks to strong public and Congressional support last year) and permanency is simply the next logical step to self-sufficiency.

In CAB, there is still opposition to legislation which would grant permanent certificates to the local lines at this time. But contrasted with last year when the board was unanimously opposed to such action, there are now various proposals that suggest the local lines are improving their position.

For one, CAB member Joseph P. Adams feels that "if there are situations where a permanent certificate would result in greater economies to the Government and better service to the public, then, in those cases, I believe permanent certificates should be granted now."

Another board member who did not make his views public and who is included in what must be considered the majority position, nevertheless suggested at private board meetings that the more successful lines should get permanent operating rights.

Likewise, outgoing Under Secretary of Commerce Robert B. Murray, who last year was in outright opposition to any permanent certificates for local lines, suggested in a late 1954 speech that the better lines should get full-time licenses.

Even the CAB majority does not say that permanency for individual carriers is out. Instead, in a December 17, 1954, letter to Sen. John W. Bricker, the board emphasized that it wishes to retain the statutory responsibility for deciding permanency in individual proceedings held by it.

Board member Josh Lee, who concurred in the majority's opposition to permanency by legislation, nevertheless, submitted a separate statement to Bricker opposing permanency either by legislation or by board action at this time. "In fact," Lee said, "there seems to be no logical point short of self-sufficiency at which the board can justify as a general policy the granting of permanent certificates."

The positions of the various board members were advanced in response to an August 19, 1954, request of the Senate Interstate and Foreign Commerce Committee. CAB in September submitted its first answer to the Committee and those made public last month were supplementary.

The majority said it "continues to believe that legislation granting permanent certificates to all of the existing local service carriers would be premature at this time.

"The board has previously given

CAB PROPOSES:

A YARDSTICK FOR LOCAL SERVICE AIRLINES

In preparation for its statement of position on the question of permanent certificates for local service airlines, CAB tested the local industry according to fifteen quantitative measurements, separated into three groups. Following illustrates how each line fared with the best score being 15 out of 15 (below the table are the actual test measurements):

		No. in Which Carrier Made Favorable 1953 showing		
Carrier	Score	GROUP I Financial Meas.	GROUP II Traffic Meas.	GROUP III Progress Meas.
Mohawk	15	4	4	7
Southwest	14	4	4	6
Allegheny	13	3	3	7
North Central	13	2	3	7
Bonanza	12	4	1	7
Piedmont	11	4	4	3
Pioneer	10	4	4	2
Ozark	7	..	..	7
West Coast	7	2	..	5
Frontier	6	..	..	6
Lake Central	5	..	..	5
Central	3	..	..	3
Trans-Texas	3	..	..	3
Southern	2	..	..	2

Measurements:

GROUP I—

1. Do carrier's commercial revenues equal its break-even need?
2. Is the carrier's total mail pay per revenue plane-mile flown lower than local industry average for 1953?
3. Is the carrier's total mail pay per dollar of commercial revenue lower than local industry average for 1953?
4. Is carrier's commercial revenue per revenue plane-mile higher than the local industry average for 1953?

GROUP II—

1. Is carrier's average pass. load per revenue plane-mile higher than local industry average in 1953?
2. Is carrier's average pass.-miles per route-mile per day higher than local industry average for 1953?
3. Is carrier's average pass. per station per day higher than local industry average for 1953?
4. Is carrier's average pass.-miles per station higher than the local industry average for 1953?

GROUP III—

1. Was there a decrease from the preceding year in the carrier's total mail pay per revenue plane-mile?
2. . . . a decrease in the carrier's total mail pay per dollar of commercial revenue?
3. . . . an increase in the carrier's commercial revenue per revenue plane-mile?
4. . . . an increase in the carrier's pass. load per revenue plane-mile?
5. . . . an increase in the carrier's passenger-miles per route-mile per day?
6. . . . an increase in the carrier's passengers per station per day?
7. . . . an increase in the carrier's passenger-miles per station per day ?

How **BRANIFF** keeps them flying on time!

Another on-time Braniff arrival! During 1954, 1,246,763 Braniff passengers arrived at their destinations on time (within 15 minutes of time published in official schedules).

Records for on-time flight operations are being shattered almost daily by Braniff across its entire system. What prompts this performance and keeps it moving is quite a story. A year and a half ago, Braniff's executives instigated an intensive on-time program. The order of that day, and each successive one, was "get it out on time."

A daily, on-time briefing session—every morning at 8:30—is probably the biggest single factor in the success of this program. This meeting is a "must" for all operational department heads. All flight operations for the previous 24 hours are charted and analyzed and every delay is put on the spot. When controllable delays show up, preventive measures are decided upon and put into effect immediately. A report of the meeting is sent that **same day** by teletype to each station manager for his information and action.

This tightening of the belt is paying off. Month after month Braniff's on-time program has improved. Such busy stations as Houston, Minneapolis-St. Paul, Chicago, San Antonio and Denver have consistently turned in on-time records of from 93% to 98% over 60 and 90 day periods.

And it's paying off with passengers, too. People fly to save time. They appreciate a business-like, on-time operation.

Above and below, Braniff department heads attend their daily 8:30 AM on-time briefing conference. Here plans are laid to obviate delays which occurred in the previous 24 hours.

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DME NEWS FROM narco

NARCO DME PRODUCTION INCREASED

Many Aircraft Now Equipped With Distance Measuring Equipment as CAA Completes DME System

With DME fully operative at 246 VOR and ILS sites along all the major airways of the U. S., pilots of hundreds of DME-equipped aircraft are already enjoying the benefits and advantages of simpler, safer, more economical IFR and VFR operations.

Expedites Approach Procedures

DME is giving these pilots positive continuous position indication enroute, lets them hit ETA's precisely with minimum calculating. New, approved DME letdown procedures are cutting many minutes off approach time normally required.

Pilots can verify or locate most favorable winds aloft by checking ground speed accurately with their DME. They are saving money, getting there quicker and operating with far less strain now that they have DME on board.

Demand Increases for Narco DME

As one pilot tells another, the demand for DME as an essential piece of equipment for safer IFR operations has resulted in stepped-up production of the Narco DME, the only DME on the market with an unrestricted CAA Type Certificate for airline use.

The Narco DME is proving superior in every important aspect for reliability, accuracy and service ease.

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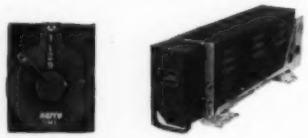
Narco DME is the only one which is tuned by positive crystal control. It is lightest in weight and requires less power. It uses the most advanced circuitry and printed wiring to save space and weight. Tubes are ARINC ruggedized design for long life. Its unitized construction permits quick disassembly. The Narco DME is the first of the new Narco Sapphire line of air transport type equipment of finest possible quality.

TWO-SCALE INDICATION

Narco DME tells the pilot his slant distance from any VOR or ILS station equipped with DME (the majority are now so equipped) on standardized panel instrument. Pilot can select 0-200 or 0-20 mile scale by turning range knob. (Nautical mile scale also available.) Narco interrogator unit, which fits standard ½ ATR rack, is tuned to station by automatic crystal control with standard frequency selector switch. Total weight is 32 pounds.



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Anderson Aircraft Radio, Detroit, Mich.
Associated Radio Co., Dallas, Texas
Atlantic Aviation Corp., Teterboro, N. J.
Aviation Radio Sales & Service, Milwaukee, Wisc.
Bayaire Avionics Inc., Oakland, Calif.
Bohling Aircraft Corp., Chicago, Ill.
Matthews Electronics, San Antonio, Texas
Minnesota Airmotive, Minneapolis, Minn.
Piedmont Aviation Inc., Winston-Salem, N. C.
Reading Aviation Service, Reading, Pa.
J. D. Reed Company, Houston, Texas
Remmert-Werner Inc., St. Louis, Mo.
Roscoe Turner Aeronautical Corp., Indianapolis, Ind.
Santa Monica Aviation, Santa Monica, Calif.

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. . . detailed reasons for this position, and perceives nothing in the current picture of the local service industry to change it, since there is no showing of reversal of the unfavorable trend in subsidy need, there is no indication that there will be any immediate reduction in the government support needed to sustain local service operations, and there is no indication that the industry may be able to approach self-sufficiency in the foreseeable future.

"This does not imply, it should be emphasized, that no carrier or route, or part of a route, which hereafter comes under the board's review in its regular route renewal program will warrant permanent certification."

Adams, disagreeing with the majority, said in his separate letter to Bricker: "Should I be correct in my appraisal of the value of air service to the smaller communities of the U. S. and the certainty of its continuance through Govt. support, the question of the term or permanency of the certificate under which this vital air transportation is provided, becomes of less significance."

He then stated, as quoted above, that where greater economies and service could be achieved, he would favor permanent certificates in those cases immediately.

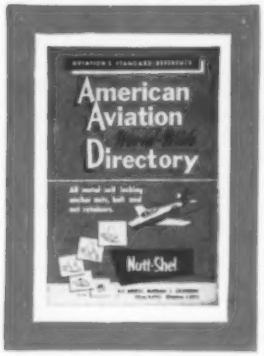
To "preserve flexibility," he suggested "that the new permanent certificate represent a skeleton of strong terminal points, with the intermediate cities qualifying for permanency as they reach a volume of traffic generation sufficient to reimburse the carrier for all direct costs and a reasonable share of indirect costs."

As for CAB majority arguments that permanency is a bar to subsidy reduction, Adams said "it is my further opinion that such reduction can be accomplished whether the carrier has a permanent or temporary certificate."

Lee, although concurring in opposition to permanency by legislation, said in his separate report that permanency is not the best means of achieving security for the local lines. ". . . if the carriers and the board could make more and faster progress toward improving the route systems of the carriers by logical route extensions, closing gaps, transferring feeder towns to feeder routes for exclusive service, and generally by rounding out their route systems, a much healthier security could be achieved than through permanent certification," Lee said.

The local service lines, meanwhile, have decided to renew their bid in the new Congress for full-time licenses. If the success achieved in the short time last year is any measure, they stand a good chance in the new Congress of going all the way.

30 CONSECUTIVE ISSUES
Sperry Gyroscope Co.
26 CONSECUTIVE ISSUES
McDonnell Aircraft Corp.
25 CONSECUTIVE ISSUES
Pioneer Parachute Co., Inc.
24 CONSECUTIVE ISSUES
Fairchild Aircraft Division
General Electric Co.
22 CONSECUTIVE ISSUES
Reeves Brothers, Inc.
21 CONSECUTIVE ISSUES
Flightex Fabrics, Inc.
Parker & Co.
Sinclair Refining Co.
18 CONSECUTIVE ISSUES
Goodyear Tire & Rubber Co.
17 CONSECUTIVE ISSUES
Elastic Stop Nut Corp. of America
16 CONSECUTIVE ISSUES
Michigan Seamless Tube Co.
15 CONSECUTIVE ISSUES
Eclipse-Pioneer Division
Paper Manufacturers Co.
14 CONSECUTIVE ISSUES
Aeroquip Corp.
Instrument Associates
Jack & Heintz, Inc.
Lavelle Aircraft Corp.
13 CONSECUTIVE ISSUES
The BG Corporation
Greer Hydraulics, Inc.
12 CONSECUTIVE ISSUES
Aero-Coupling Corp.
Electrical Engineering & Mfg. Corp.
Nutt-Shel Co.
Pesco Products Division
Pittsburgh Plate Glass Co.
11 CONSECUTIVE ISSUES
Air-Parts, Inc.
Aircraft Engine & Parts Corp.
Bendix International Division
Durham Aircraft Service, Inc.
Lear, Inc.
Rohr Aircraft Corp.
Titeflex, Inc.
10 CONSECUTIVE ISSUES
Air Associates, Inc.
Air Carrier Engine Service, Inc.
Bendix Products Division
Esso Aviation Products
Teco, Inc.
9 CONSECUTIVE ISSUES
The Aerotherm Corp.
Breeze Corporations, Inc.
Convair
Simmonds Aerocessories, Inc.
8 CONSECUTIVE ISSUES
Airwork Corp.
American Phenolic Corp.
Boots Aircraft Nut Corp.
Herman Nelson Division
The New York Air Brake Co.
Scintilla Division
F. W. Stewart Mfg. Corp.
Stratos Div., Fairchild
The Weatherhead Co.
7 CONSECUTIVE ISSUES
Philippine Air Lines
6 CONSECUTIVE ISSUES
Ace Products Co.
AiResearch Mfg. Co.
Aircraft-Radio-Marine Export, Inc.
Thomas A. Edison, Inc.
Foote Bros. Gear & Machine Corp.
Kollsman Instrument Corp.
Minneapolis-Honeywell Regulator Co.
Steel Products Engineering Co.
5 CONSECUTIVE ISSUES
Aerodex, Inc.
Aerosmith, Inc.
Hartman Electrical Mfg. Co.
L. B. S. Aircraft Corp.
Texas Metal and Mfg. Co.
Twin Coach Co.



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Protests Greet CAB Alaska Decision

AN OVERWHELMING WAVE of protests from Alaska and Pacific Northwest cities has greeted CAB's informal decision to eliminate Pacific Northern Airlines and Alaska Airlines from the States-Alaska market and the result appears certain to be another CAB vote in the controversial case.

Two other phases of the Pacific area case (West Coast-Hawaii and Trans-Pacific Renewal) were sent by CAB to the White House in December, but the Board, under the Alaskan mail and telegram onslaught, guardedly held on to the States-Alaska Case for possible future action.

At a private board meeting on December 8, CAB voted to eliminate the two Alaskan lines, keeping Northwest Airlines in Anchorage and certificating Pan American World Airways to Anchorage in addition to its present routes to Juneau and Fairbanks.

When AMERICAN AVIATION publicized this action, Alaskans took to the radio, television, and newspaper editorial columns, and sent hundreds of letters and telegrams to President Eisenhower and CAB. Initially, the CAB communications were addressed to Chairman Chan Gurney. But by late December, every board member was getting his share, including members Josh Lee and Joseph P. Adams, who opposed the majority in the Dec. 8 vote to cut the two Alaskan lines.

The White House, as is customary in such matters, stamps all of its communications and forwards them to the CAB for acknowledgment.

At presstime, there was no accurate information as to when CAB would get to the case again. This was largely because of the expiring membership of Oswald Ryan, one of the three-man majority favoring cutting the two Alaskan lines. If a new man were appointed, the board would then ostensibly be split 2-2 on the question with the new man an unknown quantity.

IATA Carriers Haul 44 Million Passengers In $2 Billion Business in 1954

The 71 airline members of the International Air Transport Association did a total business of almost $2 billion in 1954. They carried 44 million passengers (10% more than in 1953) and flew 28,000 million passenger miles. Cargo traffic at 527,400,000 ton-miles was 4% above the 1953 level while mail traffic at 199 million ton-miles was 14% up.

On the North Atlantic route 12 IATA airlines made 15,000 flights, carrying 580,000 passengers and 7200 tons of mail in 1954. The total trans-Atlantic cargo load was over 12,000 tons. Each of these figures represents a new record.

The International Civil Aviation Organization reports that the growth of traffic by the world's airlines (Red China and Russia excluded) slowed down in 1954 but still was sizably greater than in previous years. The exact figures for the development of world civil aviation since 1937 are shown in the following ICAO-prepared tables (1954 figures are estimated):

	Miles Flown	Passengers Carried	Passenger-Miles	Cargo Ton-Miles	Mail Ton-Miles	Average number of passengers per aircraft	Average distance flown per passenger
			(millions)			(number)	(miles)
1954	1206	57.8	32,000	716	217	26.5	554
1953	1156	52.0	28,580	696	188	24.7	551
1952	1059	45.0	24,540	668	175	23.2	547
1951	976	39.9	21,380	620	160	21.9	536
1950	890	31.2	16,960	518	143	19.1	544
1949	836	26.5	14,480	390	128	17.3	546
1948	789	23.5	12,990	286	114	16.5	552
1947	708	21.0	11,740	187	88	16.6	559
1946	584	18.2	9,630	82	67	16.5	529
1945	373	9.3	5,100	77	90	13.7	548
1937	165	2.5	880	n.a.	n.a.	5.3	350

n.a.—not available

Pending Cases

Applicants for north-south all-cargo routes will not have to wait for east-west applicants before getting a Board decision. CAB has severed those 'on which hearings have been held—Riddle, U. S. Airlines, and American Air Export—and termed the case the **North-South Air Freight Renewal Case.**

Left in the original proceeding—the **Air Freight Renewal Case**—are east-west proposals of Slick and Flying Tigers. Hearings in that phase, scheduled to start January 17, have been set back to April 17.

There are now four major route cases pending Presidential action at the White House. The **Trans-Atlantic All-Cargo Case** has been there for over six months. More recently sent over are the **New York-Balboa Case,** the **West Coast-Hawaii Case,** and the **Trans-Pacific Renewal Case.**

CAB Calendar

Jan. 17—Hearing, Reopened Trans-Atlantic Final Mail Rate Case (Offset Issues). Washington, D. C. Docket 1706 et al.

Jan. 18—Hearing, Pan American-LACSA Control Case. Washington, D. C. Docket 6594.

Jan. 24—Hearing, Skycoach Enforcement Proceeding. Washington, D. C. Docket 6908.

Jan. 25—Hearing, Davenport-Moline Airport Case. Washington, D. C. Docket 6804 et al.

Feb. 2—Hearing, Guatemala City-Los Angeles Renewal Case (Pan American). Washington, D. C. Docket 6615.

Feb. 15—Hearing, Paducah Service Case. Washington, D. C. Dockets 6035-6830.

Mar. 7—Hearing, Domestic Trunklines Service Mail Rate Case. Washington, D. C. Docket 6599 et al.

Recent CAB Decisions

Braniff Airways authority to suspend at Minot, N. D., on January 1, and **Frontier Airlines'** authorization to replace Braniff at Minot, stayed until final decision in the Frontier Renewal Case.

Northeast Airlines' proposed 10% increase in passenger fares suspended for 90 days pending investigation.

Riddle Airlines denied exemption for interim authority to operate certain flights between Boston and Philadelphia, on one hand, and Florida points.

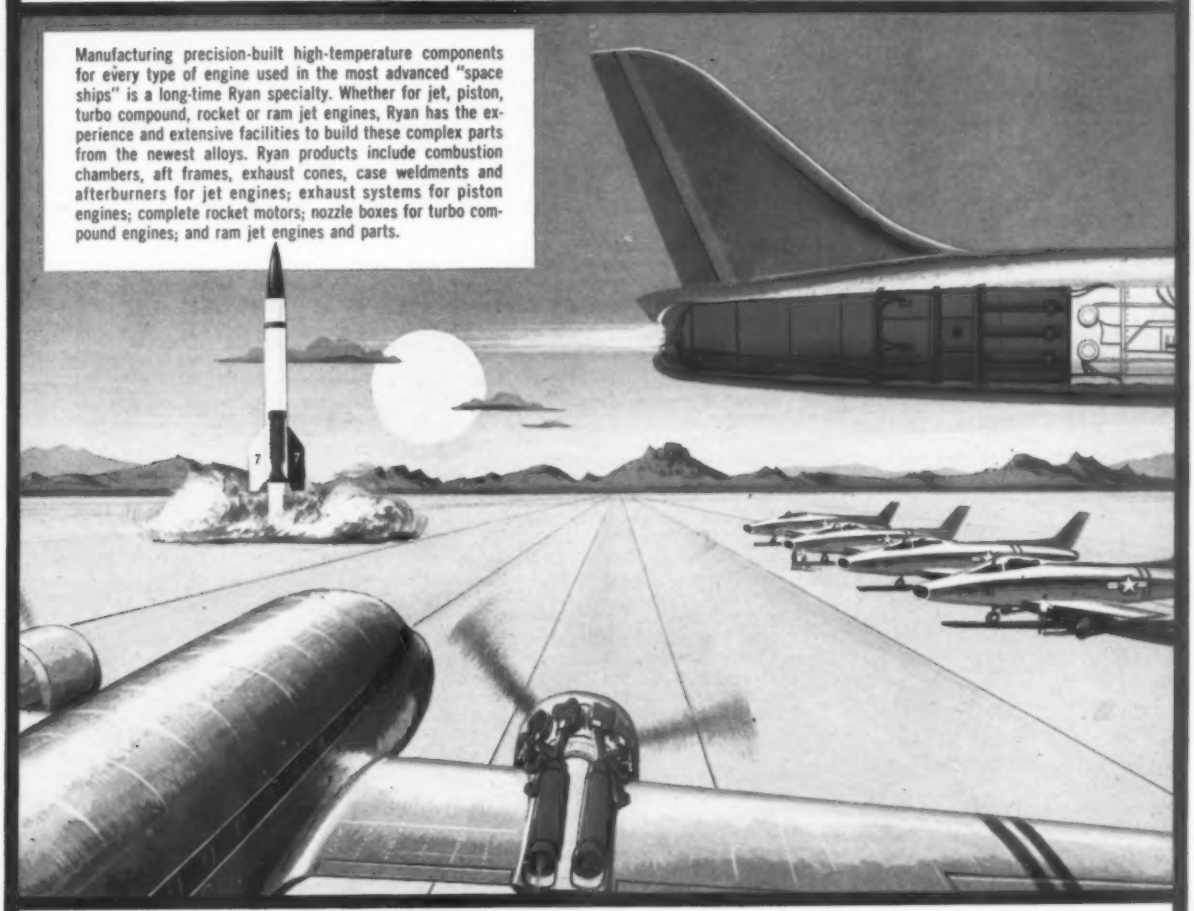
CAB Applications

North Central Airlines for a seven-year certificate for helicopter service in the Chicago-Milwaukee area and asked consolidation with the pending renewal application of Helicopter Air Service (Chicago).

Delta-C&S Air Lines applied for amendment of its Route 8 certificate to include Louisville, Ky., as an intermediate between Evansville and Indianapolis.

HOT PARTS for "SPACE SHIPS"

Manufacturing precision-built high-temperature components for every type of engine used in the most advanced "space ships" is a long-time Ryan specialty. Whether for jet, piston, turbo compound, rocket or ram jet engines, Ryan has the experience and extensive facilities to build these complex parts from the newest alloys. Ryan products include combustion chambers, aft frames, exhaust cones, case weldments and afterburners for jet engines; exhaust systems for piston engines; complete rocket motors; nozzle boxes for turbo compound engines; and ram jet engines and parts.



Another Example of How

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For 32 years Ryan has been in the forefront of aeronautical progress. It is uniquely equipped to solve the challenging research, engineering and production tasks associated with building, for America, the world's finest aircraft.

AIRCRAFT & COMPONENTS	AIRBORNE ELECTRONICS EQUIPMENT	RYAN AERONAUTICAL COMPANY SAN DIEGO 12, CALIFORNIA	AFTERBURNERS & JET COMPONENTS	PILOTLESS JET AIRCRAFT
METALLURGICAL ENGINEERING	WEAPONS SYSTEMS		ROCKET MOTORS & RAM JETS	AIRCRAFT EXHAUST & DUCTING SYSTEMS

Circle No. 35 on Reader Service Card.

Airline Commentary

By Eric Bramley

WHAT WAS the industry's outstanding sales development by 1954? Someone asked us the question, so we'll stick out our neck and give top billing to the introduction of the "pay-later" plans which seem to be opening new sources of revenue. Other developments: (1) Continued expansion of coach service; (2) Use, for the first time, of local times in timetables during daylight saving—a big convenience to passengers; (3) Expansion of the Z-circuit (teletype), which has greatly improved handling of interline reservations. Any other candidates?

* *

Noting that you can't beat the flying weather in the Burbank area, American Airlines reports that the following message was on the weather PLT recently: "BUR weather CAVU (note: ceiling and visibility unlimited). Visibility slowly improving."

* *

If the airlines were as slow as CAB, yesterday's schedules wouldn't operate until tomorrow. On Dec. 1, Northeast Airlines filed a 10% fare increase, effective Jan. 1. CAB, as usual, waited until the last minute, late on Dec. 31, before notifying NEA that it was suspending the proposed increase. How can a sales department make plans under such circumstances? NEA isn't the only airline that's been left in such a hole. Why doesn't CAB wake up and give the carriers a break?

* *

ODDS AND ENDS: Work is continuing on automatic reservations systems, but there's been a change in thinking. Trend is now toward each carrier having its own system in a large city, instead of building one set-up to handle all airlines. . . . ALMOST 2 million plane travelers used rental cars in 1954. . . . AIRLINES have stopped skycaps' "counter-hopping" practices (and it's about time) at Washington National Airport. Skycaps are now assigned definite stations, some behind the baggage counter, some out front (they change frequently to give everyone a break on the tips). Used to be that the counter was undermanned because these tip-hungry gentlemen deserted their posts to carry bags out to limos. . . .

Sales, Traffic, Promotion

Douglas Aircraft Co. has worked out distinctive 1955 advertising themes to support airlines flying Douglas planes. The manufacturer's record advertising and sales promotion budget for this year exceeds $2 million. International theme will be "Everywhere Under the Sun Depends on Douglas" . . . Agency is J. Walter Thompson. . . .

North American Airlines has set Feb. 12 as the tentative date for extending DC-6B operations to the New York-Miami route. The group of large irregular carriers started non-stop eastbound DC-6B service Los Angeles-New York on Dec. 18 but discontinued the non-stops on Jan. 3 because it found that flight couldn't be conducted under the eight-hour domestic flight time limit. A spokesman said the trips would be resumed shortly, either with multiple crews or in accordance with a CAB proposal to extend the limit to 10 hours for non-stop transcontinental schedules. North American, incidentally, will spend $1 million on advertising in 1955. Agency is Van Wood-Fischer. . . .

North Central Airlines has started a no-deposit credit plan for on-line travel only. . . . United Air Lines is now represented regularly on seven TV shows, such as Truth or Consequences, I've Got a Secret, etc. . . . New TWA film, "Air Adventure to Europe," covering student tours, is being shown at universities and to teacher groups. . . .

British Overseas Airways Corporation this year will offer the largest passenger capacity in its history, a 17% increase over 1954. Tourist-class capacity New York-London and Montreal-London will be boosted 14% and 25%, respectively. Atlantic services will be flown exclusively with Stratocruisers, and there'll be no mixed-class flights. . . . Pan American's Latin American division reports that favorable passenger reaction is now outstripping complaints by almost 9 to 1. Letters received in a recent month totaled 565 for, 65 against. . . .

The December issue of "Travel U.S.A.," publication of the National Association of Travel Organizations, carries a complete directory of travel films (including those issued by airlines) that are available for showings at schools, clubs, etc. Films are listed by states and foreign countries, with notations on type (sound, color, etc.), whether they're cleared for TV, running time, and where they're available. Directory can be obtained from NATO, 1424 K St., N.W. Washington, D. C. . . .

Pan American and Panagra will introduce reduced excursion fares for group movements to South America next summer (June-August). Groups of 15 or more passengers traveling together can save 50% of the return portion of present round-trip fares. New York-Buenos Aires tourist-class round-trip will be $684 against present $867. . . .

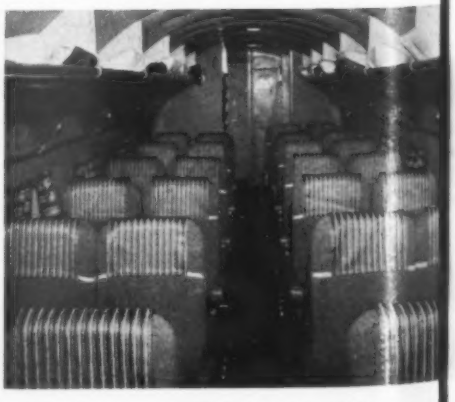
NWA Aims for $1 Million Boost in Cargo Revenue

In a major move to boost cargo revenue by at least $1 million during 1955, Northwest Airlines has created an air freight sales division and an air mail and express division. Freight director will be Thomas R. Nolan, who has been connected with NWA's cargo activities for the past 10 years. Air mail and express will be headed by Fred Erickson, 17-year veteran, who has been director of mail, express and freight sales.

Size of staffs is to be increased, and the company intends to enlist all of its 5,000 employees in efforts to stimulate cargo traffic. Special folders have been distributed to acquaint them with schedules, rates, commodities, etc.

NWA is now operating daily overnight all-freight flights between New York and Twin Cities via Milwaukee. Plans are being formulated for possible extension of service from Twin Cities to Seattle.

North Central Airlines is remodeling its 18 DC-3's in tan and green. Seats are made by Burns Aero Seat Co. Above, baggage rack is installed opposite entrance and coat closet is at right of door.



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International Aviation

By Anthony Vandyk

A gloomy forecast about the future of the helicopter, for the next few years at least, has come from British European Airways, once the leading airline protagonist of rotary-wing aircraft. Since BEA has been operating helicopters without interruption for the past seven years and pioneered scheduled rotocraft flights (not internationally, however—that honor went to SABENA Belgian World Airlines), its views merit attention.

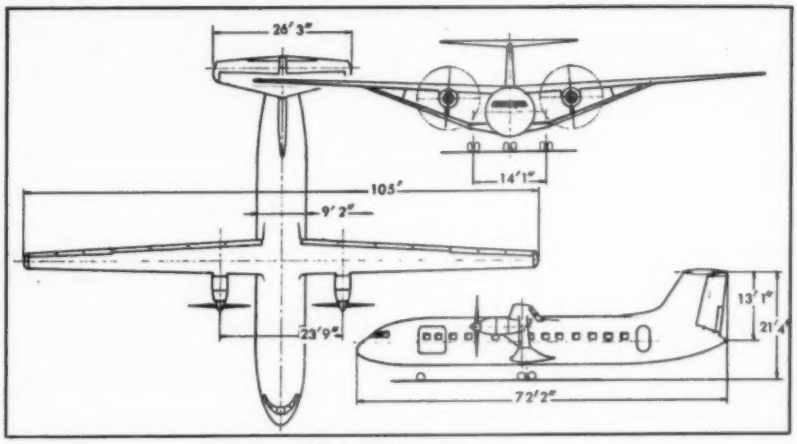
BEA says that by 1958 helicopters will certainly have no significant influence on the total of air traffic. By then, however, because of competing operations by SABENA, BEA may be operating helicopters between London and Brussels. Economists of the airline have worked out that the economic London-Brussels one-way fare (at 65% load factor) by the 120-mph type of helicopter likely to be available in 1958 would be $42.70. This compares with the surface-route first-class fare of $16.25 and the bus/fixed-wing aircraft/bus combination fare of $21.30.

By 1962 BEA estimates that a 150-mph helicopter would be available that would enable the economic London-Brussels rotorcraft fare (at 65% load factor) to be $27.30. This 150-mph helicopter would enable the city-center-to-city-center journey to be made in 1 hour 35 minutes against 2 hours for the 1958 120-mph rotorcraft. (The present bus/fixed-wing aircraft/bus combination journey between the British and Belgian capitals takes 4 hours 30 minutes while by surface route the time taken is 8 hours.)

Domestically in Britain the outlook for the helicopter is even less promising. The BEA economists reckon that even by the early 1960's helicopter passenger transportation within Britain is likely to cost between two and four times the first-class rail fare, although it will cut the journey time by half.

Although BEA expects that the helicopter will create a new class of traffic in which speed between city centers is of supreme importance, it believes that even ten years from now rotorcraft will still be expensive.

Two New Dart-powered French Turboprops



HUREL-DUBOIS HD 70

TWO FRENCH PROJECTS were recently added to the growing list of Dart-powered transport designs. They are the Hurel-Dubois HD 70 and the SNCA du Nord 2600 which are vying with each other for French government sponsorship. Both feature a high wing, gross slightly under 40,000 lbs., and cruise at about 300 mph over stages of between 300 and 900 miles. While each has two Dart turboprops, the Nord 2600 also has two wingtip-mounted Turbomeca Palas auxiliary jets to boost take-off performance.

Basically a slightly smaller, cleaned-up version of the HD 32, the piston-engine Hurel-Dubois "DC-3 replacement" now going into production (at SNCA du Sud-Est), the HD 70, retains Hurel's high-aspect ratio wing design (its aspect ratio is actually 19.1). Unlike the HD 32 it has a retractable landing gear.

The HD 70 provides accommodations for 28 to 36 passengers in normal use but if necessary up to 50 can be seated. The Hurel-Dubois company is convinced that on the relatively short routes for which the aircraft is designed frequent service by medium-capacity planes is more important to the operator than less frequent service by larger capacity aircraft (60-passenger, for instance).

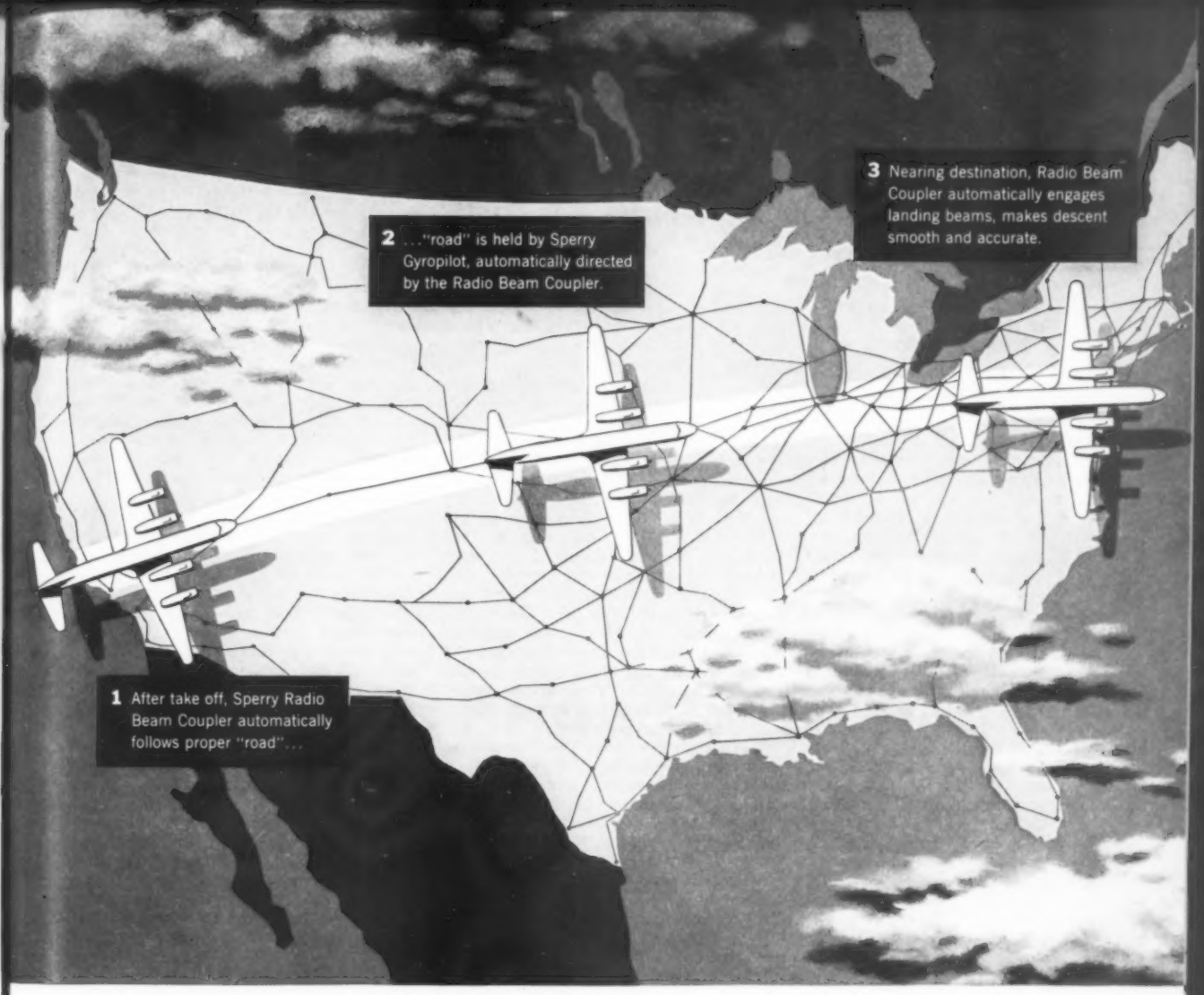
Outstanding economy is claimed for the HD 70, 4¢ to 5¢ per ton-mile for payloads of 11,500 lbs. on a 300-mile stage or of 9300 lbs. on a 900-mile stage. Gross weight of the aircraft is 36,400 lbs. and at this weight it can clear a 36-foot obstacle at 2950 feet on two engines, or the same obstacle in 4100 feet on one engine. It gives optimum performance when cruise is started at 19,700 feet (maximum cruising speed is 310 mph).

The Nord 2600 design features a span of 95 feet; aspect ratio, 11.2; length, 66 feet; empty weight (equipped), 21,700 lbs.; gross weight, 37,500 lbs.; passenger capacity, 40; cruising speed, 295 mph at 19,700 feet; take-off distance to clear a 36-foot obstacle, 3300 feet.

Transport Briefs

SABENA Belgian World Airlines has decided to buy two more Sikorsky S-55's, bringing its fleet of these rotorcraft to six, and is negotiating for a number of S-58's for delivery starting in 1956. With its S-58 equipment SABENA would connect Brussels with Paris and with the Ruhr area of Germany. The airline also plans to buy a number of twin-engine S-56's which would enable it to link Brussels by helicopter with London, Sarrebrucken, Strasbourg, Wiesbaden and Frankfort.

Spain's **Aviacion y Comercio** is planning to buy three DC-4's from Air France to supplement its fleet of Bristol 170's and SNCASE Languedocs. . . . **British European Airways** is getting two de Havilland Heron 1 four-engine transports next month; they will be used mainly as replacements for Dragon Rapide biplanes in the airline's air ambulance unit in Scotland but will also operate certain scheduled flights between Glasgow and the Hebrides. . . . **Trans-Canada Air Lines** has now set "early spring" as the starting date for its Viscount operations; the program has been slightly delayed due to late deliveries. . . . Australia's **Ansett Airways** has inaugurated service to Canberra on its eastern states network; its second Convair 340 is due for delivery in March.


1 After take off, Sperry Radio Beam Coupler automatically follows proper "road"...
2 ..."road" is held by Sperry Gyropilot, automatically directed by the Radio Beam Coupler.
3 Nearing destination, Radio Beam Coupler automatically engages landing beams, makes descent smooth and accurate.

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EN ROUTE . . .

WAYNE W. PARRISH

It's still a thrill to hop from one world to another

THE airplane sometimes provides amazing contrasts.

In November I left a swank modern hotel on Miami Beach one morning, was watching Indians performing pagan rites in a Christian church in a Guatemalan mountain village next day, and was driving through the fairyland of Los Angeles to my hotel the following evening.

To some of you this ability to change civilizations and centuries in hours may seem like old hat, but for myself I never cease to get a thrill out of hopping in a few hours from one world to another. In November the contrast was more marked than usual because I dipped into an ancient civilization for just 48 hours and right back again into the bright lights of a big U. S. city.

It came about this way. I had to make a speech to the air taxi and fixed base meetings at Miami Beach and for several days I enjoyed the sunshine and the beach and the good life down there. Then I had a business trip scheduled for Los Angeles, timed for the inauguration of the new polar route of Scandinavian Airlines System.

Meanwhile, Pan American Airways was arranging a big press trip to Guatemala to spark some interest in reviving the tourist trade there which had just about disappeared while the recent Commie government was in power. So it worked out that I could go from Miami to Los Angeles by way of Guatemala.

I got up at the crack of dawn one morning at Miami Beach and took a Pan American Constellation to Havana, San Salvador, and Guatemala City. I was pleasantly surprised in Havana to see a new airport terminal under construction and it should be pretty good when completed. In Guatemala I was met by Luis Porras, assistant district sales manager who is a faithful reader of this magazine, and had a fine lunch at El Patio, one of the best eating places in Central America.

Before driving to Lake Atitlan to join the press group, Luis did me the honor of showing me his home which is right in the heart of Guatemala City. From the street there was no indication of the gardens and patios and spacious living quarters that lay beyond the huge, forbidding doors and walls flush to the sidewalk.

It seems that Luis has been reading about bidets on this page and he was anxious to show me an old Latin American type which has been in his family for a great many years. In fact there are two, one standard size, and the old one, which is about three times the usual size and about a fourth as big as a bathtub. I've never seen anything like it. The more I get into this bidet business the more bewildered I am as to why the things never caught hold in the U. S. They are standard items in Latin America, France, Spain, and a few other countries.

It's gotten so that this business of inspecting bidets has top priority on arriving somewhere, something like visiting the pyramids, Stratford-on-Avon or the Louvre. So after the formalities with Luis, I was driven out into the countryside of Guatemala and on up the mountains to Lake Atitlan. It was a three-or four-hour ride, half of it over dusty unpaved roads, winding and twisting around and over rugged but very attractive terrain.

It was worth the trip. Guatemala is one of the most scenic countries to be found anywhere and Lake Atitlan is in a magnificent setting. The lake itself is 1700-feet deep and is surrounded by volcanic cones and mountains. Along with all of the other press people I was put up at the Hotel Tzanjuyu, a mouth-twister which is pronounced something like Sahn-Hoo-Yoo. It's a good spot with fine food.

Next morning we piled into buses and drove over winding, dusty, and rather rough roads to the village of Chichicastenango, long a tourist favorite on the two days of the week when the Indian market is in progress. (The Mayan Inn there is first class.) We were met by the Indian leaders, and the local Guatemalan officials read off a bunch of welcoming speeches.

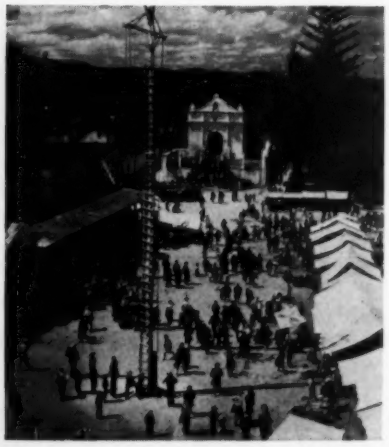
The Guatemalan Indian is much more colorful, to my way of thinking, than any other Indians north of the Panama Canal. Each one has color in his or her dress, especially the women. If you've never seen an Indian market in action, I recommend Chichicastenango as most colorful and accessible to the U. S., though I've seen larger and better ones in Peru and Bolivia.

What interested me most were the two Catholic churches on the main square. Efforts have been made to convert the Indians to Christianity but the efforts were only partially successful. The Indian uses the churches but continues to follow many of his centuries-old pagan rituals.

Before entering the church, the Indians stand on the outside steps swinging braziers of incense and charcoal to ward off and dispel evil spirits. Then they go inside and squat on the stone floor—there are very few chairs inside—and light candles on the floor and spread out petals of flowers. Then they talk for long periods of time to their ancestors, telling them how the crops are, asking help to have their wives give birth to boys (girl babies aren't desired down there), reporting on illnesses in the family, etc.

When I was in one church there must have been about a hundred Indians lighting candles and talking to their ancestors. Only the men can converse, while the women and children sit or stand close by listening and spreading out more flower petals and lighting more candles. The Indians pay no attention to visitors. Every morning a Catholic priest says Mass. When it is over, the church is open to the Indians to worship as they wish.

To say that it was weird to see these pagan rituals in progress is putting it mildly. I had just come in from smart, modern Miami. In a little over 24 hours more I would be driving from Los Angeles Airport to the Hollywood Roosevelt Hotel. But for the moment I was in a village 7,000 feet above sea level in the mountains of Guatemala in an atmosphere centuries old.



Left: Chichicastenango natives prepare their "flying pole" trapeze act for newsmen. Right: The dance.

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